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ABSTRACT

Described are the results of a formative evaluation of the time with a clock unit involving evaluations by teachers and performance of 57 preprimary and primary class educable retarded students. The unit is comprised of three sections: the clock (emphasizing the need for telling time and recognition of the clock and its purpose), time telling (including basic terms and introductory activities), and More Time Telling (focusing on more complex time procedures). The bulk of the document presents the following information for each section: description of the lessons' objectives, student performance data, teacher evaluations, and summarized comments from a teacher review board meeting. Among curriculum revisions cited are changes in material design, content, sequencing, and testing procedures. Included in five appendixes are a sample evaluation form and a description of the revised unit. (CL)

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RESEARCH REPORT #84

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TIME WITH THE CLOCK UNIT: A FORMATIVE EVALUATION[1]

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Research, Development and Demonstration
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Minneapolis, Minnesota

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The University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children has been established to concentrate on intervention strategies and materials which develop and improve language and communication skills in young handicapped children.

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TIME WITH THE CLOCK UNIT: A FORMATIVE EVALUATION[1]

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The Time with the Clock Unit is one of the five instructional units in the Money, Measurement and Time Program (Thurlow, Taylor, & Turnure, 1973) produced by the Vocabulary Development Project. This instructional unit was developed jointly by educational practitioners and educational researchers to provide educationally handicapped children with an understanding of certain time concepts which are related to the use of the clock. The Unit was first produced in an experimental form which was subjected to extensive evaluation and revision. This process resulted in a product that has been demonstrated to be easily implemented and highly effective for educable mentally retarded (EMR) children (Krus, Thurlow, Turnure, & Taylor, 1974).

This paper is a description of the evaluation of the pilot-test version of the Time with the Clock Unit. In the Project's four-stage overall evaluation design (Krus, Thurlow, Turnure, Taylor & Howe, 1974), the evaluation of the pilot-test version represented Stage Three, and was referred to as the "formative" evaluation of the Time with the Clock Unit. The major purpose of the formative evaluation was to provide a systematic basis for the revision of the Unit. The formative evaluation represented the assessment of the product during the process of its development and involved the evaluation of its effectiveness and useability in the classroom, feedback to the developers, and subsequent changes in the materials based upon the feedback information. Data obtained during this formative evaluation are included here, with a description of the resultant changes in the Time with the Clock Unit.

Background of the Time with the Clock Unit

A search of the curriculum materials for teaching time-related skills and vocabulary indicated that the available materials were geared primarily for children of normal intelligence, or for children with entry level skills (e.g., reading and/or counting skills) exceeding those of EMR children of elementary school age. Based upon the evident need for instruction for EMR children, the specific time-related needs of these children were assessed and organized into an instructional package consistent with a verbal elaboration-based instructional approach found to be successful with EMR children (Taylor, Thurlow, & Turnure, 1974). This phase of research to development was discussed by Thurlow, Taylor, and Turnure (1973).

Description of the Time with the Clock Unit

During the formative evaluation stage, the Time with the Clock Unit was divided into three books of instruction. In addition, two versions of "experimental lessons" were developed. These lessons dealt with basic time concepts not directly related to the clock (day, night), and were designed to be used prior to all other instruction.

The two versions of the "experimental lessons" presented the same content, but represented two different approaches to it. Version A consisted of two tape lessons which presented the general concept of a "day" as the time from one morning to the next, and taught the three times of a day ("morning," "afternoon," and "night"). Version B consisted of two tape lessons which presented the concepts "day" (the time when it is light outside) and "night" (the time when it is dark outside), and then taught two times of a day as "morning" and "afternoon."

The instruction in Book One (The Clock) consisted of three tape lessons which presented the need for being able to tell time, recognition of the clock and its purpose, and beginning time telling (using the word "o'clock").

Book Two (Time Telling) consisted of six lessons (four tape presentations) which presented the basic terms used in telling time, and included introductory activities for beginning time-telling related to these terms.

Book Three instruction (More Time Telling) included five lessons (two tape presentations) and was concerned with basic terms and skills involved in more complex time telling (i.e., telling time to the minute). (See Appendix 1 for a list of the specific lessons in each book of instruction.)

The instructional materials in the Time with the Clock Unit included teacher's editions (three books), cassette tapes containing definitions and stories related to important time concepts, a book of pictures for each student to follow as the tape was presented ("Big Picture Books" for the experimental lessons and Book One; individual student texts for Books Two and Three), and numerous worksheets and transparencies to complete the instruction. A more complete description of the materials (and the underlying instructional techniques) used during the formative evaluation may be found in Taylor, Thurlow, and Turnure (1973).

Subjects

Two pre-primary classes (N = 25), two primary classes (N = 24), and one combined class (N = 8) participated in the formative evaluation of the instruction in the Time with the Clock Unit. As defined by the school system from which the classes were obtained, children in pre-primary classes ranged in age from approximately five to eight years, and children in primary classes were from approximately eight to ten years of age.

The pre-primary children participating in this study had an IQ range of 52-80 ($\underline{\bar{X}}$ = 69.9, *SD* = 6.8) and an age range of 5.3 to 9.0 years of age ($\underline{\bar{X}}$ = 7.5, *SD* = 4.1). The IQ range for the children from the participating primary classes was 60-80 ($\underline{\bar{X}}$ = 74.0, *SD* = 5.7) and the age range was 6.2 to 8.8 years of age ($\underline{\bar{X}}$ = 9.2, *SD* = 0.8). The IQ range for the children in the combined class was 64-76 ($\underline{\bar{X}}$ = 68.4, *SD* = 2.3) and the age range was 6.3 to 10.0 years of age ($\underline{\bar{X}}$ = 8.2, *SD* = 1.5).

Procedure

The formative evaluation design (Krus, Thurlow, Turnure, Taylor, & Howe, 1974) involved feeding back information from the pilot-test of the instructional materials to the developers for revision. The feedback information was obtained in a variety of ways.

First, testing was done to obtain feedback on the effectiveness of the instruction, and furthermore, to develop a testing instrument which would be appropriate for later field-testing of the Unit. Since the Time with the Clock Unit attempted to avoid making assumptions about the children's ability levels, each objective was tested two or three different ways during the formative evaluation to insure accurate measurement (Bart, personal communication). Prior to instruction, students were given a pretest on the objectives. Post-testing of the same objectives was conducted after instruction ended. Also, since the materials incorporated the concept of the "growth of meaning" (i.e., more sophisticated aspects of a word's meaning were embedded in later lessons), numerous tests were given frequently during the instruction (post-lesson testing). These tests were used mainly to determine the immediate "worth" of the lessons (e.g., whether or not the objectives were met immediately after related instruction was presented). If 80% mastery was not demonstrated on a given objective, it was then included in the next test to ascertain if later instruction affected performance. In addition, these tests frequently included questions related to objectives not yet taught. Such questions were asked in order to determine any "transfer" that instruction might have to performance on future objectives. (See Appendix 2 for a copy of test questions used.)

A Teacher Review Board made up of the teachers using the materials during the formative evaluation stage was another source of feedback for revision. Throughout the formative stage, teachers completed detailed written evaluations of each lesson. (See Appendix 3 for a sample evaluation form.) Teachers also participated in a "Teacher Review Board" meeting when all instruction was completed. The Teacher Review Board meeting involved a four-hour discussion of all instruction, including sequencing, pictures, and any problems not covered by the evaluation forms.

Information from classroom observations was a third source of feedback for revision. Since the tape presentations were designed to build vocabulary skills, observations were made primarily on this part of the instruction. Special attention was given to the use of the materials by the teachers, and the response of the students to the tape presentations (e.g., whether or not they answered questions, gestured appropriately, etc.). Because of the quantity and subjective nature of the classroom observation data, these data have not been included in the results section of this paper. It should be noted, however, that the information obtained through classroom observations was discussed at the Teacher Review Board meeting and implications for revisions are included within that summary.

A final source of feedback utilized during the formative evaluation of the Time with the Clock Unit was the results obtained from submitting the posttest data to factor analysis and order analysis. Although these results were primarily used in the revision of the Time test, they also provided insight into the adequacy of instructional sequencing, both in terms of substantiating what existed in the pilot-test version and in suggesting revisions to the Unit.

Results

A summary of the revision information obtained from each of the sources of feedback is included here. This information is organized so that all the feedback obtained from any one book of instruction is presented together. For each book, there is a lesson by lesson description of (1) the objectives tested, and (2) the information obtained from the teacher evaluation forms. The description of the objectives tested includes data from tests given prior to instruction ("Pre"), tests given during instruction ("Post Lesson"), and tests given following all instruction ("Post Unit"). Next, in each section is a summary of the information obtained at the Teacher Review Board meeting about that particular book of instruction.

Following the book by book feedback data, there is a brief description of the procedures and results of dimensional analyses of the pilot-test questions (pp. 69-72). This description concludes the Results section.

Formative Evaluation of Time With The Clock Unit

Experimental Lessons

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EXPERIMENTAL LESSONS: TIME WITHOUT THE CLOCK

A. Objectives

1. Demonstrates "part" by coloring in one part of a pie .
2. States "light" when asked "Is it light outside or dark outside right now?"
3. Labels "morning" when shown a morning scene.
4. Describes morning when shown a picture of a boy waking up.
5. Labels "night" when shown a night scene.
6. States "dark" when asked: "Is it usually light outside or dark outside at night?"
7. Defines night activities when asked: "What are some things people do at night that they don't do at any other part of the day?"
8. States "afternoon" when asked: "What time (part) of the day comes after morning?"
9. States "morning, afternoon and night" when asked: "What are the names of the parts of the day?"
10. Orders pictures of "morning," "afternoon," and "night" according to how they come during the day.

B. Performance of classes

Version A

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Demonstrates part	77	--	90	100	--	100
2. States "light"	85	100	90	88	100	100
3. Labels "morning"	23	90	90	63	71	100
4. Describes morning	54	60	50	63	43	50
5. Labels "night"	69	50	90	50	57	100
6. States "dark"	46	70	100	75	43	67
7. Defines night	46	90	70	75	71	83
8. States "afternoon"	31	50	80	50	29	16
9. States 3 parts of day	15	40	30	12	43	16
10. Orders 3 parts of day	23	50	50	25	43	33

Version B

	School 3		
	Pre	Post Lesson	Post
1. Demonstrates part	67	--	100
2. States "light"	100	89	89
3. Labels "morning"	67	78	78
4. Describes morning	44	78	56
5. Labels "night"	33	89	78
6. States "dark"	78	44	100
7. Defines night	0	56	78
8. States "afternoon"	33	67	67
9. States 3 parts of day	0	22	22
10. Orders 3 parts of day	22	33	67

C. Interpretations

1. The mean for the two Version A classes was 86% pre and 93% post on demonstrating "part." In the Version B class this same objective was at a 67% pretest and a 100% posttest. According to this data, instruction on the prerequisite concept "part" can be minimal. The instruction provided in Version B appeared slightly more effective, based on the gain to the 100% level.
2. Generally, data obtained for the three classes were about at the same level in showing an understanding of light. Only minimal review is indicated, and other instruction can assume an understanding of this concept.
3. Below criterion performance in pretest scores for all three pre-primary classes shows a need for instruction on labeling morning. With more significant gains made in the Version A classes, it appears that the instruction included on "morning" in Version A was more effective.
4. Performance in all three classes at pretesting also shows a need for instruction on describing morning. Although the Version B class showed an increase almost to criterion following the lesson, preformance dropped to a level comparable to the Version A classes at the time of posttesting. Added instruction is indicated in Version B to adequately reinforce this concept. Revision in the instruction provided in Version A would definitely be needed.
5. Pretest scores indicate that instruction is necessary on labeling a night picture. Post lesson data showed instruction in Version B significantly more effective with the class achieving criterion. With a drop in the Version B and an increase in Version A classes at posttesting, performance levels at posttesting were comparable.

6. Based on pretest scores, some instruction on the prerequisite concept "dark" is indicated. Post lesson testing in all classes indicated that neither version adequately provided instruction (and both generally had a decreasing effect) on the understanding of night. Revisions are needed in the instruction.
7. The 0% pretest performance level in the Version B class and a mean pretest performance level of 57% in the Version A classes showed a definite need for instruction on defining night. Although data indicate Version A classes performed above criterion at post lesson testing, a closer analysis of the data reveals a gain of 56 percentage points in the Version B class and 25 percentage points in the Version A classes. Posttesting performance on the three classes was comparable, but with the larger gain achieved in the Version B class (due to low pretest score). The instruction provided in the version appears to be more effective.
8. Low pretest scores in the three classes indicate a need for instruction on the concept "afternoon." Mean post lesson scores of 41% for Version A and 67% for Version B, show a slightly greater effect of instruction from the Version B approach. A small difference in mean performance scores between Version A and Version B Schools at posttesting (56% and 67%) showed the Version B class still performing slightly better than Version A. This was due, however, to School 2 continuing to decrease in performance as School 1 increased (School 1 was the only class to finally obtain criterion on this objective). Further investigation is indicated before any final recommendation can be made in regard to revision of the instruction.
9. Extremely low pretest scores obtained on this objective (stating three parts of a day) show a need for the instruction. Gains were comparable between versions--each being inadequate. Major revisions on instruction pertaining to stating the three parts of a day is necessary.
10. Although ordering the parts of a day should have been more difficult than stating the parts, the testing item for ordering had the students manipulating cards and thus the appropriate response could occur by "chance." Also, the design of the test question may be somewhat invalid since unambiguous representations were made (e.g. an activity depicting something done in the afternoon could also be done at night). Thus, the observed performance may be lower than the actual ability level. Generally, low pretest scores show a need for instruction on the three parts of the day. With small increases occurring at post lesson testing in all three of the schools, no definite statement can be made on the effectiveness of one version over the other. Revisions to the instruction and the test question will be necessary.

Teacher Evaluations of Experimental Lesson (Version A)

Lesson 1 - A Day (2 teachers)

A. Purpose, Objectives, Lesson Plan, and Materials Needed

1. It was felt purpose and objectives were clearly stated and appropriate for "some" to "most" of the children.
2. Both felt "some" of the children had reached the objectives before the lesson began.
3. Lesson Outline was considered useful in planning activities and tape presentation.
4. No materials were required.

B. Pre-Activity

1. Both felt "some" of the children in class needed the pre-activity.
   a. "Most" to "all" of children needing pre-activity benefitted from it.
   b. Enjoyable ("short enough") for those knowing concepts.
2. Time: 5-6 minutes
3. Both felt activity and its explanation were sufficient. (NOTE: One teacher noted that the class further discussed what it was like when it's dark outside - difficulty seeing, etc.)

C. Tape Presentation

1. Although one teacher felt the pre-activity adequately prepared the children for the tape, the other teacher felt the children were distracted - still thinking of light and dark when the tape began. It was suggested that the pre-activity be done at a time other than right before the tape.
2. Introductory Relation - both felt the children listened and attended to the picture. One teacher noted that the Introductory Relation was "very good" at preparing the children for what the lesson was designed to teach.
3. Definitions - both felt that "most" children obtained a functional definition of day; however, additional reinforcement was needed.
   a. One teacher noted that the word "day" itself was very difficult for children unless correlated with the day of the week.
   b. Other teacher indicated that it might help if the tape emphasized that it would still be the same day when they are sleeping.

4. Elaborations - generally helpful
    a. One teacher noted that the birthday party example was "great" because children easily related to it.
    b. Other teacher liked showing Simon eating breakfast and what he did during rest of day. Suggested that a summary showing whole day in sequence would have helped.
5. Relations - it was felt most children understood the relations presented
    - Suggestions for strengthening Summary Relation:
    a. Show whole sequence of Simon's activities in one picture.
    b. One teacher had children draw pictures of things done, or will do, today. Felt this reinforced idea that a day is whole 24 hour period.
6. Pictures: One teacher noted that Summary Relation picture may not have been appropriate
7. Time: 15-20 minutes

D. Post-Activities

1. One teacher was unsure that the post-activities strengthened the concepts or that they were sequenced in the best way.
2. Required Activities
    a. #1 - very good. 4 minutes spent on activity.
    b. #2 - one teacher felt activity was enjoyable (15 minutes); other indicated that children knew the word "today" better than "day" - placement of activity was confusing.
3. Optional Activity - very good for reinforcement of word "day" (one teacher used immediately after tape).
4. Suggestion for additional activity: Discuss what child has done today and what they will do later today, after school.

E. General Comments on Lesson

1. Neither teacher noted difficulty with having this lesson first.
    a. One teacher questioned whether children were educationally and motivationally ready for the next lesson.
    b. Other teacher wondered if "yesterday" and "tomorrow" could be added to the lessons.
2. One teacher was unsure whether the purpose and behavioral objectives of the lesson were met.
3. It was felt that "some" to "most" children knew the concept of day at the end of the lesson.
4. The tape (and optional post-activity) were most popular aspects of lesson.

5. Considered most important aspect of lesson to be:
    a. Tape (1 teacher)
    b. Discussion during Post-activities (1 teacher)
6. Suggestion: One teacher definitely felt the lesson presented too many concepts for young children. Could not suggest how to change it, but felt it must be changed for young children.
7. Total Time on Lesson (felt to be "about right")
    a. 2 days - 35 minutes
    b. 3 days - 60 minutes

Lesson 2 - Times of a Day (2 teachers)

A. Purpose, Objectives, Lesson Plan, and Materials Needed

1. It was felt purpose and objectives were clearly stated and appropriate for "some" to "most" of the children.
2. Both felt "some" of the children had reached the objectives before the lesson began.
3. Lesson Outline was helpful.
4. No materials were required.

B. Pre-Activity

1. Both felt "some" of the children in class needed the pre-activity.
    a. "Most" to "all" of children needing activity benefitted from it.
    b. Enjoyable for those knowing concepts - all could participate.
2. Time: 5-10 minutes
3. Both felt activity was sufficiently explained. One teacher suggested asking entire class (or one child at time) to make three movements; then have them state what they did first and next.

C. Tape Presentation

1. Both felt pre-activity adequately prepared children for the tape.
2. Introductory Relation - both felt children listened and attended to picture. One teacher noted that the Introductory Relation was excellent for young children - geared to their level and done very well.
3. Definitions - it was felt that the children did not all obtain functional definitions for the words.
    a. One teacher noted that the oldest students had no trouble; the younger ones really had little understanding at end of tape. It was indicated that the tape brought in new words and ideas too fast.

   b. Other teacher indicated that most problems were with the word "afternoon."
4. Elaborations - generally helpful
   a. Zoo elaboration was good
   b. Problem - children were confused because lunch came so soon after breakfast; not enough elaboration on morning activities.
5. Relations - generally, most children did not seem to understand the relations presented.
   - Suggestion for strengthening Summary Relation: Immediately have children give a few examples of things they do during each part of the day.
6. Pictures: Considered all pictures good; might have helped to relate #2 to school.
7. Time: 20-25 minutes

D. Post-Activities

1. Both felt the post-activities strengthened the concepts presented in the tape. One teacher commented, in fact, that they were "very necessary."
2. Required Activities
   a. #1 - very important for strengthening concepts. 20 minutes spent on activity (one teacher repeated next two days, about 15 minutes each day).
   b. #2 - very good; most had no trouble. About 10 minutes spent on activity.
   c. #3 - very good to continue every day.
3. Optional Activity - one teacher noted that activity was a very good reinforcer: helped children understand concepts. Other teacher indicated children had difficulty because they could remember what Ted had done, but couldn't relate it to what they do.

E. General Comments on Lesson

1. Both agreed with ordering of lessons.
2. Both felt purpose and behavioral objectives were met; however, one teacher noted many were still having problems with "afternoon."
3. Both felt "most" children knew the concepts by the end of the lesson.
4. Both felt the tape was the most popular aspect of the lesson; one noted that discussion and review were least popular (but so necessary).
5. Considered most important aspect of the lesson to be:
   a. Summary Relation
   b. Post-activity #1

6. Suggestions for improving lesson:
    a. Include more work on "afternoon."
    b. Add more activities for slower children. Also, perhaps use 2 tapes so concepts can be taught more slowly.
7. Total Time on Lesson (felt to be about right)
    a. 2 days - 25 minutes
    b. 4 days - 120 minutes

Teacher Evaluation of Experimental Lessons (Version B)

Lesson 1 - Day and Night (1 teacher)

A. Purpose, Objectives, Lesson Plan, and Materials Needed

1. It was felt purpose and objectives were clearly stated and appropriate for "all" of the children.
2. It was felt that "most" children had reached the objectives before the lesson began.
3. Lesson Outline was considered very helpful in planning activities and tape presentation.
4. No materials were required.

B. Pre-Activity

1. It was felt that "all" of the children in class needed the pre-activity. "Most" children needing the pre-activity benefitted from it (some needed even more).
2. Time: 15 minutes
3. It was felt activity was sufficiently explained.
   --Suggested addition to pre-activity: Ask questions like -
   "When it's time to go to bed, is it light or dark?"
   "When you come to school, is it light or dark?"

C. Tape Presentation

1. It was felt pre-activity adequately prepared the children for the tape. Liked having pre-activity lead right into tape presentation.
2. Introductory Relation - children listened and attended to picture. Big Picture Book was very good. Tape was bad - could hear old Money tape during pauses. Teacher had to finish by reading tape script herself.
3. Definitions - some children obtained functional definitions for "day" and "night," others didn't (when asked what time it was when it was light out, they would respond with "dark"). [Definitions of "today" and "tonight" were non generalizable.]
4. Elaborations - generally helpful
   --Both elaborations (day, night) were considered to be very good.

5. Relations - it was felt children understood the relations presented.
   --Summary Relations was considered to be very good: held the children's interest.

6. Pictures: All were considered to be very good. It was noted that children enjoyed the pictures.

7. Time: 30 minutes (took a little longer than usual because teacher had to read tape to class).

D. Post-Activities

1. It was felt post-activities strengthened the concepts presented in the tape.
2. Required Activities
   a. #1 - very good; children participated and seemed to enjoy.
   b. #2 - enjoyable; all participated and experienced success.
3. Optional Activity - good for strengthening meaning of words.

E. General Comments on Lesson

1. It was noted that most children were educationally and motivationally ready to proceed to next lesson - have mastered "day" and "night."
2. Agreed with ordering. Indicated that the experimental lessons should be included in unit because some children really needed these vocabulary words before proceeding.
3. It was felt the purpose and behavioral objectives of the lesson were met. "Most" children knew the concepts "day" and "night" at the end of the lesson.
4. Mr. Time and tape story were most popular.
5. Tape presentation and Big Picture Book were considered to be the most important aspects of lesson.
6. Total Time on Lesson (felt to be "about right")
   3 days - 90 minutes (extra time for tape)

Lesson 2 - Time of the Day (1 teacher)

A. Purpose, Objectives, Lesson Plan, and Materials Needed

1. It was felt purpose and objectives were clearly stated and appropriate for "all" of the children.
2. It was felt "most" of the children had needed the objectives before the lesson began. (More understood "morning" and "afternoon" than understood "day" and "night.")
3. Lesson Organizer very helpful.
4. No materials were required.

B. Pre-Activity

1. It was felt that "all" of the children needed the pre-activity (at least for review).
   --"All" children needing activity benefitted from it.
2. Time: 5 minutes
3. It was felt activity was sufficient; children might be bored with any more.

C. Tape Presentation

1. It was felt pre-activity adequately prepared children for tape - very smooth flow.
2. Introductory Relation - very good; children listened and attended to picture; seemed to understand they were going to learn two times of day.
3. Definitions - it was felt all but possibly one child had functional definitions for "morning" and "afternoon."
4. Elaborations - generally helpful
   --Both were good and held children's interest.
5. Relations - children seemed to understand relations presented.
   --Summary Relation was interesting and a good review.
6. Pictures: All very good.
7. Time: 20 minutes

D. Post-Activities

1. It was felt the post-activities strengthened the concepts presented in the tape.
2. Required Activities
   a. #1 - very good; children participated in discussion.
   b. #2 - good; children responded to questions; they were ones children could answer and all experienced success.
3. Optional Activity - good, gives each child an opportunity to show he knows words; enjoyable.

E. General Comments on Lesson

1. Agreed with ordering of lessons.
2. Indicated experimental lessons were good and necessary - should be included with unit.
3. It was felt purpose and objectives of lesson were met - "most" knew concepts by end of lesson (only 1 or 2 had some trouble).
4. Children enjoyed lesson
   a. Tape and Big Picture Book were most popular.
   b. Discussion questions were least popular.
5. Total Time on Lesson (felt to be "about right")
   4 days - 90 minutes

(Teacher Review Board Meeting)

Comments on Experimental Lessons

A. General Comments

1. All teachers, even those with older children, felt the experimental lessons (in expanded form) should be included in a first book of the Unit.
2. Suggested sequence:
    a. Day, Night - this lesson would define "day" as the period when it is light outside and "night" as the period when it is dark outside ("light" and "dark" would be introduced first; possibly in a pre-activity).
    b. Morning, Afternoon - this lesson would introduce morning and afternoon as "parts" of a day.
    c. Before, After - these terms would ideally be presented in a lesson by themselves. If not, could be pre-activites for "early," "on time," and "late."

B Lesson 1 - A Day (Version A); Day and Night (Version B)

1. The definition of "day" presented in version A was too difficult (day = time from when you wake up one morning to when you wake up the next morning).
2. It was decided that the Version B definition (day = time when its light outside) with "night" introduced at the same time would be most appropriate for young children.
3. The terms "light" and "dark" should be reviewed before they are used to define "day" and "night."

C. Lesson 2 - Times of a Day (Version A); Times of the Day (Version B)

1. It was suggested that the concepts presented in Version A were too difficult for young children (morning, afternoon and night as part of day).
2. Version B presentation was considered to be better (only morning and afternoon as part of day; night presented earlier).
    - It was suggested, however, that the elaboration of morning should be expanded, and should allow for a stop tape where the children could discuss morning events.

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Book One

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BOOK ONE - LESSON 1: EARLY, ON TIME, AND LATE

A. Objectives

1. Identifies what was done before a specific activity.
2. Identifies what was done after a specific activity.
3. States that getting to school before it starts is getting there early.
4. States that getting to a movie after it starts is getting there late.

B. Performance of classes

Pre-Primary

	School 1			School 2			School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Identifies before	15	40	40	13	50	50	11	33	44
2. Identifies after	54	60	90	50	64	83	86	100	78
3. Matches early	46	70	60	63	50	83	67	67	56
4. Matches late	31	50	40	67	44	67	67	44	67

Primary

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Identifies before	62	92	89	62	83	-
2. Identifies after	85	92	89	77	100	83
3. Matches early	85	75	78	69	83	92
4. Matches late	69	67	67	46	92	75

C. Interpretations

1. Pretest scores in both pre-primary and primary classes illustrate a need for instruction on the prerequisite concept "before." Since the objective was not mastered in the pre-primary classes, and further since the performance level was low after instruction, the inclusion of additional activities is indicated.
2. In two of the three pre-primary classes, performance on identifying an "after" activity was well below criterion and indicated a need for the instruction at this level. Since data from all five classes on the concept of "after" revealed a higher performance than on the concept "before" it appears

that "after" may be mastered at an earlier stage than "before." These data indicate that "after" should be presented first (the instruction on "after" appears adequate based on post-testing), then "before" should be taught.

3 & 4. Across all classes but one, need for instruction on both concepts "early" and "late" was indicated. Post-lesson testing revealed that in only one class criterion was reached on these objectives. Revisions to the instruction should be made: additional experiences are necessary.

Lesson 1 - Early, On Time and Late (4 teachers)

A. Purpose, Objectives, Lesson Plan and Materials Needed

1. All felt purpose and objectives were clearly stated; appropriate for "some" (2), "most" (1), or "all" (1) of children in class
2. It was felt that "some" (3) to "most" (1) of the children had reached the objectives before the lesson began.
3. All felt Lesson Outline was very helpful.
4. Materials needed were easy to obtain.

B. Pre-Activities

1. Need for pre-activities varied: "None" - 1, "Some" - 1, "All" - 2
    a. "Some" (1) to "all" (3) of the children needing the pre-activities benefitted from them.
    b. Enjoyable for those knowing concepts.
2. All felt format of activities was perfect (no required activities - selection was up to teacher); could choose type and number of activities most appropriate for class.
3. Activities used.
    a. #1(4) - good, children paid attention. One teacher suggested activity could be strengthened by having 3 or 4 children in line to sharpen pencils (more challenging). Problem in one class arose because children took a long time to sharpen pencils (others got impatient); might be better to just call children to front of room.
    b. #2(4) - very good
    c. #3(4) - generally considered good, but in some classes activity was distracting (idea of taking off shoes was too funny to some), or children not particpating became restless. Teacher with distraction problem suggested activity be dropped or article of clothing be changed (jacket).
    d. #4(3) - very good; children were able to do.
    e. #5(4) - very good
    f. #7(1) - good
    g. #8(3) - very good

C. Tape Presentation

1. All felt pre-activities adequately prepared children for tape.
2. All felt Lesson Organizer was helpful. It was especially good because it got birthday parties out of their systems before tape began.

3. Introductory Relation - all felt children listened and attended to picture. In one class, the children thought children's invitations said 2:00 - should be held straight in picture.
4. Story format was considered very helpful by 3 teachers; one felt it was neither helpful nor distracting.
5. Definitions - all but one teacher felt children had obtained functional definitions for "early," "on time," and "late." One teacher felt the definitions were rote.
6. Relations - all felt children understood relations by end of tape
   -- Generally, Summary Relation was considered to be very good.
7. Pictures - all pictures were considered to be very good. There was one suggestion - each child arriving should be holding his invitation (only "on time" child was).
8. Time: 20 (2) - 25 (1) minutes. One class took only 5 minutes.

D. Post-Activities

1. All felt post-activities strengthened concepts presented in tape.
2. Required Activities
   a. #1 - very good; children were successful and all participated; enjoyed.
   b. #2 - very good; children really enjoyed discussion.
3. Optional Activity (2) - good; one teacher simply discussed rather than doing (all had experiences before).

E. General Comments on Lesson

1. All teachers felt sequence of lessons was appropriate. Once again noted that experimental lessons should be first.
2. All felt the purpose and behavioral objectives of the lesson were met.
3. It was felt that "most" (2) to "all" (2) knew the concepts by the end of the lesson.
4. Children enjoyed lesson.
   a. Tape presentation was most popular in all classes.
   b. One teacher noted that some of the pre-activities were least popular; another mentioned the post-activities.
5. Considered most important aspect of lesson to be:
   a. Tape (3 teachers)
   b. Post-Activity #1 (1 teacher)
6. Total Time on Lesson (felt to be "about right")
   a. 2 days - 30 minutes
   b. 3 days - 30 minutes
   c. 4 days - 80 minutes
   d. 4 days - 105 minutes

BOOK ONE - LESSON 2: THE CLOCK

A. Objectives

1. Identifies a clock from a set of distractors.
2. Labels a clock.
3. States "to tell time" when asked: "Why do people look at clocks?"
4. Selects picture of clock when asked to find what is used to find out the time.
5. Labels the "face" on a toy clock.
6. Labels the "hands" on a toy clock.
7. Labels the "numbers" on a toy clock.
8. Identifies one "different" object from a set of three objects.
9. Describes the hands on a clock (a long and short hand).
10. States "numbers" and "hand" when shown a clock with no numbers and one hand and asked: "What's missing?"

B. Performance of classes

Pre-Primary

	School 1			School 2			School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Identifies clock	92	100	90	100	100	100	89	100	100
2. Labels clock	92	100	100	88	100	100	78	67	100
3. Defines clock	54	100	100	63	100	100	78	89	89
4. Selects clock	100	-	100	100		83	100	-	100
5. Labels face	0	80	100	0	100	100	22	78	89
6. Labels hands	38	90	100	63	83	100	67	100	100
7. Labels numbers	85	-	100	100	-	100	78	-	100
8. Identifies different	100	-	100	100	-	100	89	-	100
9. Describes hands	15	90	80	38	100	33	44	89	78
10. States numbers and hands	-	-	100	-	-	100	-	-	67

Primary

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Identifies clock	100	100	100	100	100	100
2. Labels clock	100	100	100	100	100	100
3. Defines clock	92	100	100	92	100	100
4. Selects clock	100	-	100	100	100	100
5. Labels face	0	100	100	0	82	100
6. Labels hands	85	100	100	38	92	100
7. Labels numbers	100	-	100	100	-	100
8. Identifies different	100	-	100	100	-	100
9. Describes hands	85	83	78	38	100	92
10. States numbers and hands	-	-	100	-	-	92

C. Interpretations

1-4. Four behavioral levels of responding were tested on the "clock" in objectives 1-4 (indentifying, labeling, defining, and selecting the clock given the definition). Children at the primary level showed mastery on all behaviors tested. Children at the pre-primary level showed mastery on all behaviors except for defining clock. Minimal instruction is all that is necessary on the clock. On the most difficult objective tested, providing a definition of the use of the clock, mastery was obtained following the instruction provided in the lesson.

5. Use of the term "face" in labeling the parts of the clock was found to be lacking in all five classes being tested. Post-instructional gains show a successful lesson.
6. Use of the term "hands" in labeling parts of the clock appeared more frequently than "face"; however, instructional need was indicated. Instruction provided in the pilot-version was satisfactory (100% performance level).
7. The data indicate that the basic behavioral objective of labeling "numbers" can be assumed for instruction in the Time Unit.
8. From the high performance level of the five classes tested in this evaluation, understanding of the prerequisite concept "different" can be assumed and instruction will not be needed.
9. Need for instruction on the behavioral objective of describing hands (one long and one short) was indicated by the data. Since criterion was inconsistently obtained after instruction, additional instruction is indicated; or, more specifically, additional experience for the students in describing the characteristics of hands.

10. Testing of this objective was primarily for evaluating the test question. Since pretest scores were not obtained, comments on the effectiveness of the instruction cannot be made.

Lesson 2 - The Clock (4 teachers)

A. Purpose, Objectives, Lesson Plan, and Materials Needed

1. All felt purpose and objectives were clearly stated and appropriate for "some" (3) or "all" (1) of the children.
2. Three teachers felt "some" children had reached the objectives before the lesson began; one felt "none" had (none knew parts of clock).
3. Materials needed were easy to obtain.

B. Pre-Activity

1. It was felt that "none" (1), "some" (2), or "most" children needed the pre-activity.
    a. "Most" (2) to "all" (2) children needing pre-activity benefitted from it.
    b. Generally enjoyable for those knowing concepts; one teacher noted some children seemed bored.
2. Time: 2-3 minutes (1); 5 minutes (1); 10 minutes (2)
3. All felt activity and its explanation were sufficient.

C. Tape Presentation

1. All felt pre-activity adequately prepared children for the tape presentation.
2. Introductory Relation - all felt children listened and attended to picture. One teacher noted cover picture should have been of Mr. Time.
3. Definitions - all felt children had obtained functional definitions for all words (clock, face, hands).
4. Elaborations - generally helpful
    a. One teacher noted the elaborations for "hands" and "face" were very good.
    b. Another noted she especially liked teacher-directed elaborations on "face."
5. Relations - all felt children understood relations presented.
    -- All felt Summary Relation was very good.
6. Pictures: Generally, all pictures were felt to be very good (#3 and #5, excellent).
7. Time: (varied)
    a. 10 minutes (1)
    b. 15 minutes (1)
    c. 20 minutes (1)
    d. 30 minutes (1) - discussed a lot during teacher-directed elaborations

D. Post-Activities

1. All felt post-activities strengthened the concepts presented in the tape.
2. Required Activities
   a. #1 - very good; generally considered simple. One teacher suggested making it more difficult by having an incomplete clock (missing hands or numbers). One teacher used this activity to lead right into #2.
   b. #2 - very good; great for self-expression.
   c. #3 - good
   d. #4 - very good; only problem arose when children were putting on numbers - couldn't place correctly.
3. Optional Activity (1) - fun and helpful for having children remember "face" and "hands."

E. General Comments on Lesson

1. All felt sequence of lesson was appropriate.
2. All felt purpose and behavioral objectives of lesson were met.
3. It was felt "most" (1) to "all" (3) knew concepts by end of the lesson.
4. Children enjoyed lesson
   a. Making clocks appeared to be most popular.
   b. Pre-activities were probably least popular.
5. Generally, teachers could not separate one aspect of lesson as being more important. The tape presentation was noted by a couple as being excellent.
6. Total Time on Lesson (felt to be "about right")
   a. 2 days - 70 minutes
   b. 3 days - 45 minutes
   c. 3 days - 90 minutes (2 teachers)

BOOK ONE - LESSON 3: LET'S TELL TIME

A. Objectives

1. Tells time to the hour.
2. Demonstrates the position of the hands at 5 o'clock.
3. States "12" when asked: "At 4 o'clock, where is the long hand pointing to?"

B. Performance of classes

Pre-Primary

	School 1			School 2			School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Tells time on the hour	31	90	80	63	83	100	56	78	67
2. Demonstrates o'clock	31	90	90	25	83	83	44	78	78
3. Defines o'clock	15	80	80	38	83	67	44	89	78

Primary

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Tells time on the hour	38	67	100	69	82	100
2. Demonstrates o'clock	69	92	100	77	100	100
3. Defines o'clock	46	100	89	77	92	100

C. Interpretations

1. Pretest data obtained across the five classes (with a 52% mean performance level) illustrated the need for instruction on telling time on the hour in both pre-primary and primary level classes . With all but one class mastering the objective

by posttesting, instruction in the Unit appears adequate, and would be complete with the addition of activities reinforcing the skill.

2. Pretest scores between the two levels of classes differed in regard to ability in demonstrating the position of hands at 5 o'clock. Performance of the pre-primary classes ($\overline{X}$ = 35%) was at or below their performance on objective #1 (telling time to the hour). Data from the primary classes ($\overline{X}$ = 57%) was above their performance in telling the time to the hour.

   Posttest scores showed that mastery was obtained both the pre-primary and primary class and indicated that instruction was adequate. Further, mastery by pre-primary classes indicate the appropriateness of the objective at this level.

3. Low performance scores across classes on pretesting illustrated the need for instruction on defining o'clock. With all classes obtaining mastery immediately following instruction as shown in the post-lesson scores, instruction appears adequate. Small decreases in three of the classes, however, show the need for the concept to be reinforced if it is seen as a necessary and important concept in the Clock Unit.

Lesson 3 - Let's Tell Time (5 teachers)

A. Purpose, Objectives, Lesson Plan, and Materials Needed

1. All felt purpose and objectives were clearly stated and appropriate for "some" (3), "most" (1) or "all" (1) of the children.
2. All felt "some" of the children had reached the objectives before the lesson began.
3. Materials needed were easy to obtain.

B. Pre-Activity

1. It was felt "none" (1), "some" (3), or "most" (1) children in class needed preactivity.
    a. "Most" (2) to "all" (3) children needing pre-activity benefitted from it.
    b. Good review and enjoyable for those knowing concepts.
2. Time: 1-10 minutes
3. All felt activity and its explanation were sufficient.

C. Tape Presentation

1. All felt pre-activity adequately prepared children for the tape presentation.
2. Introductory Relation - all felt children listened and attended to picture. One teacher noted that cuckoos were fast - some children had trouble counting them.
3. Definitions - three teachers felt children had obtained a functional definition of "o'clock"; one felt the definition was rote; another noted that those children who had no previous experience with clocks or time had great difficulty.
4. Elaborations - generally helpful
    a. Elaboration #2 was noted as being especially good.
    b. One teacher noted that #1 might be a little long.
5. Relations - all but one teacher felt the children understood the relations by the end of the tape.
    -- One teacher noted she liked teacher-directed Summary Relations. Another noted that this Summary Relation might be improved if Alice asked the questions, or reminded children of when she looked at cuckoo clock (what time does it say?).
6. Pictures: All pictures were considered to be very good.
7. Time: 15 - 25 minutes

D. Post-Activities

1. All felt the post-activities strengthened the concepts presented in the lesson.

2. Required Activities
   a. #1 - very good; one teacher suggested children should be involved even more.
   b. #2 - very good (worksheet); one teacher extended activity (after all were done, asked them to color clock showing 2:00 red, etc.).
   c. #3 - very good; children were eager to use their clocks.
   d. #4 - very good; one teacher noted that step "h" from Activity #3 should be used with this worksheet as a review.
   e. #5 - some noted children became bored with this activity; one suggested more direct involvement of children would help.
3. Optional Activities
   a. #1 (2 teachers) - enjoyed
   b. #2 (3 teachers) - good, very enjoyable
4. Suggestions for additional activities:
   a. More activities and worksheets on telling time (o'clock).
   b. Game - each child has turn to give class a time; children in class set time on own clock and lead child checks.
   c. Make large clock on floor, strings for hands. Children set "o'clock" times.

E. Supplementary Activities (Early, On Time, Late in Relation to Clock)

1. Four teachers tried some of the activities; the other did not feel they were appropriate for class; another teacher used #1 and found activity too difficult for children.
2. Activities used:
   a. #1 (4 teachers) - good for advanced children
   b. #2 (3 teachers) - good for advanced children (highest class: very enjoyable)
   c. #3 (2 teachers) - good

F. General Comments on Lesson

1. All agreed with sequencing of lessons.
2. All felt purpose and behavioral objectives of lesson were met.
3. It was felt that "most" (2) to "all" (3) children knew the concepts at the end of the lesson.
4. Children enjoyed lesson
   a. Post-activities were most popular
   b. Pre-activity or tape may have been least popular.
5. Generally, the post-activities were considered to be the most important aspect of the lesson.
6. Total Time on Lesson (felt to be "about right")
   a. 3 days - 60 minutes
   b. 4 days - 90 minutes
   c. 6 days - 100 minutes
   d. 6 days - 150 minutes
   e. 6 days - 210 minutes

Comments on Book One

A. Useability of materials

1. Children pay much better attention when format is a story or dialogue.
2. "Stop tape" at end of page is good. Children often have trouble responding during pauses.
3. Big Picture Book creates some discipline problems with large groups of children.

B. Tape Presentation

1. Generally, children seem to be listening better. Both Mr. Time and Big Picture Books seem to contribute to this.
2. Story format was most effective.

C. Big Picture Book

1. Big Picture book was considered very effective, especially for younger children.
2. One teacher noted the Big Picture Book required too much of the teacher; had difficulty regulating book and monitoring children.

D. Mr. Time

1. All felt Mr. Time was extremely effective.
2. One teacher noted Mr. Time wasn't used as fully as he should have been. Picture should appear to least once in each lesson.

E. Introductory Tape

-- All felt introductory tape was valuable; motivated children.

F. Diagnostic Placement Test

-- All but one teacher felt class had been placed in unit appropriately; one teacher felt placement was too low.

G. Content

1. Word Selection: All felt words selected were appropriate; would not add any.
2. Instruction: All felt the instruction had met the objectives. Many teachers made comments which suggested they were very pleased with Book One.

Comments on Book One

A. Lesson 1 - Early, On Time, and Late

1. It was suggested that this lesson should be the last lesson in a preceding book (i.e., it would go with the "experimental" lessons).
2. The pre-activities were felt to be especially important, and it was suggested that they might be expanded into a full lesson.
3. No problems with the tape were noted.

B. Lesson 2 - The Clock
- All aspects of this lesson were felt to be "fine."

C. Lesson 3 - Let's Tell Time

1. It was noted that this lesson became a problem for children who didn't know the numbers 1-12.
   a. It was suggested that it might be appropriate to have a pre-activity which would work on number recognition, using counting as a crutch.
   b. Perhaps a specific review of "long hand" and "short hand" would also be helpful.
2. Tape Presentation
   a. The Introductory Relation was interesting to the children, but the cuckoos were too fast.
   b. The elaborations should be expanded; important and difficult concepts are presented very quickly.
3. Post-Activities
   a. Active involvement is very important here. Suggested methods for increasing active involvement included:
      1) Puzzles
      2) Clock on floor
      3) Children working at blackboard
   b. Add more worksheets, especially to activity #4.
   c. Activities should be expanded.
      1) Instruction should be very structured and sequential - stabilize understanding and then move on.
      2) Before moving to instruction on the notation for times on the hour (i.e., X:00), there should be several activities where the word "o'clock" is used.

Formative Evaluation of Time With The Clock Unit

Book Two

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BOOK TWO - LESSON 1: HOUR HAND AND MINUTE HAND

A. Objectives

1. States "minute hand when asked: "What's another name for the long hand?"
2. States "hour hand" when asked: "What's another name for the short hand?"
3. States "minute hand" when asked: "Which hand moves faster--the minute hand or the hour hand?"

B. Performance of classes

Pre-Primary

	School 1			School 2			School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. States minute hand	0	67	80	14	40	67	0	56	100
2. States hour hand	0	56	80	14	20	67	0	56	89
3. States relative movement of hands	23	78	78	88	100	75	22	67	67

Primary

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. States minute hand	15	58	67	-	-	58
2. States hour hand	15	58	56	-	-	58
3. States relative movement of hands	31	67	44	62	-	100

C. Interpretation

1 & 2. Low pretest scores indicated that the labels "minute hand" and "hour hand" are not used by the population tested. Since criterion was not obtained after instruction in all cases revisions (e.g., change in approach to the definition, provide more experiences) are necessary.

3. This test question provided the students with a choice of two responses. Pretest performance varied around the 50% level. Therefore, it can be concluded that instruction on this objective is necessary. Since two choices were provided in the question for responding, post-test scores should have been above the 80% criterion level. With only one class reaching 100% performance, revisions are indicated.

Lesson 1 - Hour hand and Minute hand (5 teachers)

A. Purpose, Objectives, Lesson Plan and Materials Needed

1. Four teachers indicated that the objectives were clearly stated.
2. The purpose and objectives were considered appropriate for "most" (1) or "all" (4) of the children.
3. It was felt that "none" (3), "some" (1) or "all" (1) of the children had reached the objectives before the lesson began.
4. All felt lesson outline was very helpful.
5. Materials needed were easy to obtain.

B. Tape Presentation

1. No one felt a pre-activity was needed to prepared the children for the tape.
2. All felt the Lesson Organizer was helpful. Two commented that it served as a good review and one felt it was all that was needed.
3. Introductory Relation - all teachers felt that this interested the children and got them to look at the cover picture.
   - a. Four teachers felt that the children attended to what was being said. One noted that some children were looking through the book during tape even though previous time had been given for this.
   - b. All teachers felt the cover picture was appropriate One commented that the children were enthused with it and one that they recognized it was Mr. Time.
   - c. All felt that the Introductory Relation prepared children for what the lesson was to teach.
4. Presentation of Words - all felt the words were presented in the best possible order. All teachers felt that there was "always" a smooth flow from one word to the next.
5. Definitions: Three teachers felt the children obtained definitions for the presented words, two did not.
   - a. Hour hand - one teacher said the children didn't have much of a definition; two said the definition was functional; one said the definition was rote for most, with only a couple of children having functional definitions; and one said the definition was rote for about half the class and functional for the other half.
   - b. Minute hand - same as hour hand.
6. Elaborations - the elaborations were always helpful.
   - a. One teacher said the hour hand elaboration got sympathy from the kids and they didn't even wait for the tape to ask for help.
   - b. One felt they were good because they gave opportunity for the child to point in his book.

7. Relations - teachers indicated that the relationships between the words were "understood" (3) and "not understood" (1). **One teach**er felt unsure because some knew the relations and some didn't.
    a. All but one teacher felt the Summary Relation played a significant role in insuring that the child understood; the one teacher was unsure.
    b. No one said that the Summary Relation could have been more effective or interesting. Four teachers also commented on how good they were and how the children enjoyed them.
8. Pictures - generally considered good.
    a. #1-#4 - good
    b. #5 - good to excellent. One teacher commented that pictures 5 through 9 didn't go with story, that there wasn't a biggest apple, and in the end he really picked the smallest; children had a big discussion about this.
    c. #7, #8, #9 - good
9. Time: 20 - 45 minutes
   One teacher noted she had to stop tape often so children could turn pages; she feels her big book in the front is less distractable for the children.

C. Post-Activities

1. All felt the post-activities strengthened concepts that had been developed. There were no difficulties in directing them.
2. The post-activities were sequenced in the best way. One teacher especially liked reviewing minute hand and hour hand before showing movement of hands.
3. Suggestions for other activities:
    a. Give each child a clock and draw one on the board. Then tell them to place the hands on certain numbers. This way all children are involved.
    b. One teacher would have liked an activity where she could tell the children to circle the hour hand or the minute hand.
4. Activities Used:
    a. All teachers used the first required activity. Four teachers commented that they really liked the game idea and one specifically said more games should be used. Time: 20-30 minutes.
    b. All teachers used the second required activity. One liked using a real clock and one like showing the children movement of the hands. Time: 10-15 minutes.
    c. Three teachers used the optional activity. Two of these teachers commented that the children really enjoyed this activity.

D. General Comments on Lesson

1. All but one agreed with sequencing of lessons.
    a. One teacher indicated children were not ready to proceed to next lesson, another teacher was unsure.
    b. Two teachers indicated there were words that should be taught prior to this lesson.
2. All felt the purpose and behavioral objectives of the lesson were met.
3. It was felt that "some" (1) to "most" (3) to "all" (1) knew the vocabulary concepts at end of lesson.
4. Children enjoyed the lesson. The story of Grandfather Time, the tape, the post activities, the team game, and the story of Mr. Time were listed as most popular.
5. One teacher recommended a few more activities and another felt the tape wasn't appropriate at this time.
6. Two teachers thought the tape was the most important aspect of the lesson, one **the** repetition of the post activity, and one the story of Grandfather Time.
7. Total Time on Lesson (felt to be "about right" by 2, and "too short" by 2)
    a. 2 days - 60 minutes
    b. 3 days - 60 minutes
    c. 3 days - 105 minutes
    d. 5 days - 90 minutes
    e. 5 days - 150 minutes

BOOK TWO - LESSON 2: TELLING TIME ON THE HALF HOUR

A. Objectives

1. Tells time on the half hour (using the word "thirty").
2. Demonstrates the position of the hands at 5:30.
3. States "6" when asked: "Where does the minute hand point to when it's 4:30?"

B. Performance of classes

Pre-Primary

	School 1			School 2			School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Tells time 1/2 hour	23	44	56	13	60	100	0	33	33
2. Demonstrate thirty	23	67	78	13	80	100	11	11	67
3. Defines thirty	0	56	67	25	60	75	0	0	56

Primary

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Tells time 1/2 hour	23	67	78	23	-	83
2. Demonstrate thirty	31	100	78	23	-	100
3. Defines thirty	23	58	67	15	-	92

C. Interpretation

1-3. Performance on the three behavioral levels testing time telling to the half hour (telling time, demonstrating, defining) showed virtually no difference in pretest ability level within classes and overall.

It is interesting that the performance on these objectives was about 30 percentage points lower than on the same objectives related to hour ("o'clock"). This indicates that the lessons are effectively sequenced. Another interesting feature in comparing the objectives on hour and half hour is that the same slight difference in pretest scores (performance of demonstration is slightly above time telling and that time telling is slightly above defining) was demonstrated.

Substantial gains were obtained but with the overall low performance at pretesting, criterion was not achieved in all classes on all objectives. Possibly either lack of time spent on the objectives or lack of instruction in the Unit may be the cause. Some revision to the present instruction is indicated.

Lesson 2 - Telling Time on the Half Hour

A. Purposes, Outline, Materials Needed

1. Four felt the purpose and objectives were clearly stated, and that they were appropriate for "all" (3) or "most" (2) of the children.
2. It was felt that "None"(3) or "some" (2) of the children had reached the objectives before the lesson.
3. All felt the lesson outline was helpful in planning, and none had suggestions for improvement. One commented that it was good to know that the pre-activities should lead right into the tape and that the last post-activity was very important.
4. Materials needed were easy to obtain.

B. Pre-Activities

1. All felt the steps in the activity were clear and none would have changed the structure.
2. It was felt that "some" (1) "most" (2), or "all" (2) of the children needed the pre-activity.
   a. Of those who needed the pre-activity "most" (2) or "all" (3) benefitted from it.
   b. For those not needing it, the activity served as a good review and helped to get things started.
3. Time: 5-10 minutes
4. The pre-activity was sufficiently explained for all and no one felt any other pre-activities should be added.

C. Tape Presentation

1. It was felt the pre-activity adequately prepared the children for the tape presentation.
2. Introductory Relation - all felt children listened and attended to picture.
   a. All teachers felt the cover picture was appropriate for the introductory relation.
   b. The introductory relation prepared the children for what the lesson was designed to teach them and it prepared all of the teachers for the tape presentation.
3. Definitions: Two felt the children had obtained definitions for each of the words.
   a. Two said only "most" did and one commented that the elaboration didn't emphasize "thirty" enough. One teacher felt the definitions were not obtained.
   b. Two teachers said "thirty" was learned on a functional basis, one said "some" learned on a rote basis and one said "most" learned rote and a "few" functional.

4. Elaborations - four felt the elaborations were helpful to the children and one felt they were neither helpful nor distracting. One felt the story with Ricky was good and one felt they helped show the children that they couldn't put "thirty" and "o'clock" together.
5. Relations - all but two felt the children understood the relationship between words (one was "unsure," and one felt the relations were not understood).
    a. All felt the Summary Relations played a significant role in insuring the children understood; one especially liked that it was teacher directed.
    b. No suggestions were made as to how to make the Summary Relations more effective.
6. Pictures: It was felt that all of the pictures were very good; one said picture #4 was "distracting and confusing."
7. Time: 15 - 30 minutes

D. Post-Activities

1. All felt the post-activities strengthened the concepts developed in the tape.
2. Three said the post-activities were sequenced in the best way, one was unsure and felt a good post-activity could be done on number sequence and which hour it is when the hour hand is between two numbers.
3. One teacher said that the word "half past" should be included in the post-activities. One said more worksheets should be included. Another said more worksheets on having to say a certain thirty, identifying clocks with thirty, and more making a clock should be added. One suggested that somewhere it should have been pointed out where the hour hand goes at thirty minutes past the hour, and the last one commented that for #3 she used the large clock on the floor (children enjoyed).
4. Required Activities
    a. #1 - good to very good. One noted that the fact that the hour hand was halfway between two numbers was pointed out. Another teacher suggested this activity should have been used at the end.
    b. #2 - very good; one teacher thought this activity should be first.
    c. #3 - very important; hard for some to understand.
    d. #4 - good, but it was suggested that more review was needed (worksheets).
    e. #5 - good, children really enjoyed.
    f. #6 - good; blackboard activity was very enjoyable.
    g. #7 - very good; good evaluation activity.

E. General Comments

1. Generally, the sequencing of the lessons was agreed upon, with the suggestion that "half past" should been included here. It was also felt that more time should have been spent on hour before going to half hour; also, "thirty" should be presented before minute and hour hand.
2. It was generally felt that the purpose and objectives had been met.
3. It was felt that "some" (1), "most" (3) or "all" (1) children knew the vocabulary concepts at the end of the lesson.
4. Children enjoyed lesson.
    a. The tape and post-activities were listed as most popular by one, two said worksheets, two said the work at the blackboard and one said the story.
    b. One teacher said the least popular activity was when the children just sat and answered questions.
5. Suggested additions to lesson.
    a. And type of game
    b. More worksheets
    c. Lesson on number sequence
6. The most important aspect of the lesson was considered to be the post-activities, especially #7.
7. Total Time on Lesson (felt to be "about right" (3) or "too short" (1)).
    a. 8 days - 4 hours
    b. 12 days - unspecified
    c. 4 days - 1 1/2 hours
    d. 10 days - 6-6 1/2 hours
    e. 9 days - 2 hours 45 minutes

BOOK TWO - LESSON 3: HOUR

LESSON 4: HALF HOUR

LESSON 5: HOUR AND HALF HOUR

A. Objectives

1. Demonstrates half when asked to "color in half the pie."
2. Demonstrates the change in the position of the hour hand in one hour.
3. States "hour" when asked: "Which is a longer time, an hour or a half hour?"

B. Performance of classes

Pre-Primary

	School 1			School 2			School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Demonstrates half	0	-	0	0	-	0	0	-	11
2. Demonstrates change in position of hour hand.	31	78	89	14	40	25	0	22	67
3. States relative duration of hour	31	22	33	38	30	25	33	33	56

Primary

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Demonstrates half	0	-	0	8	-	75
2. Demonstrates change in position of hour hand.	23	92	78	-		-
3. States relative duration of hour	54	75	78	92	-	75

C. Interpretation

1. Data collected showed a lack of understanding on the prerequisite concept of half. Further analysis was indicated and a survey of 8 teachers concluded that the test question was not testing a basic understanding of half. It was suggested that if a student was checking to see if he had received "half" a candy bar, he would be able to measure a "half" precisely. There was not sufficient time, however, to validate this criticism of the test question. From the extremely low scores obtained, however, the assumption that these children had an understanding of half cannot be made and instruction should be included.

2. Low pretest scores show that instruction on the change in the position of the hour hand is necessary. Gains achieved are impressive but since criterion was only obtained in one class, additional activities to reinforce the concept are necessary.
3. This test question provided the students with only 2 choices for responding; the observed mean performance appeared around the chance level (52%) for both pre and post. Need for instruction is indicated and further, the instruction provided appeared inadequate and revisions are imperative. It can be predicted that a more thorough understanding of half (objective 1) should have a positive effect on mastering the relationship between hour and half hour; therefore, additional instruction on both objectives (1 and 3) is necessary.

Lesson 3 - Hour (2 teachers)

A. Purpose, Objectives, Outline and Materials

1. The purpose and objectives were considered appropriate for "most" (1) or "all" (1) of the children.
2. "None" of the children had reached the objectives before the lesson.
3. The materials needed were easy to obtain.

B. Lesson Format

1. Both agreed that the teacher-directed approach allowed for greater flexibility in presenting the concepts. One commented that this made it especially easy to repeat a concept as much as necessary.
2. Definitions - it was felt the children had obtained definitions for the words presented.
   -- One teacher felt the children had learned a rote definition for "hour."
3. Both teachers were "unsure" whether the children understood the relationship between the word "hour" and previously taught words.
4. Time: 20 minutes; 40 minutes
5. One teacher felt the format worked for the lesson but felt the children got a little restless. The other also felt it was effective (did not give children their own clocks at first because they were distracting but made each child demonstrate with his own clock at the end).

C. Post-Activities

1. It was felt that the post-activities strengthened the concepts developed in the lesson, were sufficiently explained, and were sequenced in the best way.
2. Suggestion for other activities: Worksheets on picking out clocks and drawing in hands.
3. Both teachers used both activities.
   a. Activity #1 - one felt it was good, but a little disrupting to the class. The other teacher thought it was a necessary activity, but not real popular.
   b. Activity #2 - good for those who could grasp it, but may have been presented a little too soon.

D. General Comments

1. Both teachers were "unsure" whether the children were ready for the next lesson.
2. Only one teacher indicated that lesson met the purpose and objectives stated.

3. It was felt that "some" (1) to "most" (1) of the children knew the vocabulary concepts at the end of the lesson.
4. Children enjoyed the lesson, but they were neither overly nor under excited at any part.
5. The most important aspect of the lesson was considered to be the individual questioning.
6. Total time of lesson: (one felt it was "too short")
   a. 5 days
   b. 3 days

Lesson 4 - Half Hour (2 teachers)

A. Purpose, Objectives, Outline, Materials

1. Both felt the purpose and objectives were clearly stated, and appropriate for "most" (1) or "all" (1) children in class.
2. It was felt that "none" of the children had reached the objectives before the lesson.
3. The lesson outline was helpful in planning the activities.
4. The materials needed were easily obtained.

B. Pre-Activity

1. One teacher did not use the pre-activity. The teacher who used the activity took whole objects and tore them in half. This was followed by the children orally stating what she had done.
2. One teacher felt it was good to have left the pre-activity up to the teacher; the other was not sure (her children could not carry the idea of half over to the clock).

C. Lesson Format

1. Both liked the teacher-directed format.
2. One teacher was unsure whether the children had obtained definitions for the words following the presentation and the other felt about half of them had.
3. Definition - one teacher felt the definition of "half hour" was rote for some and not learned at all by others. The other teacher felt it was learned functionally by two, rotely by three, and not at all by one.
4. In one class some of the children understood the relationship between the word for this lesson and previously taught words; in the other class the teacher was unsure.
5. Time: 25 minutes; 15 minutes
6. Specific comments included the comment that the lesson was more functional after the class did some half-hour exercises. Also, the story helped to clarify half hour. The other teacher suggested that "half-past" would have been a better term. She also said that the children were confused with that fact that there was a 6 on the clock and not a 30 and that perhaps it would be better to wait to introduce 30 until after they learned to count minutes.

D. Post-Activities

1. The post-activities strengthened the concepts developed in the lesson format.
2. The post-activities were sufficiently explained and were sequenced in the best way.

3. Suggestions were to include more activities and lots of review.
4. Activities Used:
   a. Activity #1 - good, important for understanding concepts. Maybe too difficult to present to large group.
   b. Activity #2 - good practice.

E. General Comments

1. The teachers were unsure whether the children were ready for the next lesson.
2. One teacher felt unsure of whether any other words should have been taught prior to the lesson and one said no other words were needed.
3. One teacher agreed with the order of the lessons and the other felt all of the hour concepts should have been taught together.
4. It was felt that the lesson format and activities met the purpose and objectives of the lesson.
5. It was felt that "some" (1) to "most" (1) of the children knew the vocabulary at the end of the lesson.
6. Most children enjoyed the lesson.
   a. The tape presentation was most popular in one class.
   b. Lack of motivation in second class impaired popularity (teacher attributed this to too much repetition).
7. It was felt that individual questions were the most important aspect in insuring the children learned the concepts.
8. Time spent on the lesson was: (felt to be "about right" by one and a little "too short" by another)
   a. 5 days - 2 1/2 hours
   b. 3 days - 1 1/2 hours

Lesson 5 - Hour and Half Hour (2 teachers)

A. Purpose, Objectives, Outline, Materials

1. The purpose and objectives were clearly stated, and considered appropriate for "all" children.
2. "Most" (1) or "none" (2) of the children had reached the objectives before the lesson.
3. The materials needed were easily obtained.

B. Tape Presentation

1. It was indicated that one class needed a pre-activity to prepare them for the tape and one class did not.
2. The lesson organizer was helpful.
3. Introductory Relation: The introductory relation interested the children.
    a. The children attended to what was said while looking at the cover picture and the teachers felt the cover picture was appropriate.
    b. The introductory relation prepared the children and the teachers for what the lesson was designed to teach.
4. Presentation of Words: The words were presented in the best possible order and there was a smooth flow from one word to the next.
    -- The new format of using one context throughout the lesson was helpful.
5. Definitions: It was felt that both concepts (hour and half hour) were learned rotely.
6. Elaborations: The elaborations were helpful to the children.
7. Both teachers were unsure whether the children understood the relationship between the words by the end of the lesson.
    a. The Summary Relation played a significant role in insuring that the children understood the relationships. One teacher commented that more should be added to it.
    b. One suggestion for making the Summary Relation more effective was questions by the teacher.
8. All pictures and worksheets were used and were felt to be non-distracting, except worksheet #4.
9. Time: 30 minutes; 15 minutes

C. Post-Activities

1. One teacher felt the post-activities strengthened the concepts from the tape presentation; the other did not.
2. Suggestion: Include more worksheets.

3. Activities Used:
   a. Activity #1 - confusing. Children had very difficult time differentiating "hour" and "half hour."
   b. Activity #2 - although it was noted that worksheets reinforce the learned concepts, Worksheet #4 was felt to be confusing.
   c. Activity #3 - good review, although didn't seem to be effective in one class.
   d. Activity #4 - used by only one teacher. Children did not seem to understand the concept presented.

D. General Comments on the Lesson

1. One teacher felt the children were ready for the next lesson and the other was unsure.
2. One teacher agreed with the ordering of the lessons and the other did not know how necessary lessons 3, 4 and 5 were as they completely confused her class.
3. Only one teacher felt that the activities and tape met the objectives of the lesson.
4. It was felt that "some" (2) of the children knew the vocabulary concepts at the end of the lesson.
5. Both teachers felt the tape was the most popular aspect of the lesson.
6. One teacher indicated that the worksheet was the one aspect of the lesson that best insured the children learned the concept.
7. Time spent on lesson: (felt by one to be "too short" and by the other to be "too long").
   a. 7 days - 3 1/2 hours
   b. 10 days - 3 1/2 hours

BOOK TWO - LESSON 6: SECOND AND SECOND HAND

(Supplementary Activities: Counting by Fives)

A. Objectives

1. Demonstrates the duration of a second in response to: "Show me something that you can do in a second."
2. States "second" when asked: "Which is shorter, a second or a minute?"
3. Labels "second hand" on a picture.
4. Demonstrates ability to count by fives while pointing to the appropriate numbers around a clock.

B. Performance of classes

Pre-Primary

	School 1			School 2			School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Demonstrates second	33	0	11	13	20	100	22	22	67
2. States relative second duration	38	33	44	63	20	50	44	67	67
3. Labels second hand	8	0	0	0	0	50	0	0	33
4. Demonstrates five minute intervals (counting)	-	0	11	-	0	25	-	0	0

Primary

	School 1			School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. Demonstrates second	8	33	33	31	-	100
2. States relative second duration	54	50	44	62	-	83
3. Labels second hand	0	0	0	8	-	92
4. Demonstrates five minute intervals (counting)	-	8	67	-	-	75

C. Interpretation

1. Instruction is indicated to teach the concept of the duration of a second. Since criterion was reached in only two of the classes following all instruction, revision is indicated.
2. Since this test question offered two choices for answers, and since response to the relative duration of a second was at chance level for both pre and post ($\underline{\bar{X}}$'s = 54% and 52%); it can be concluded that instruction is needed on the objective and that the instruction provided in the pilot-version was inadequate. Since the test question dealt with a choice between second and minute, revisions to instruction on both the second and the minute will be necessary.
3. Low pretest scores indicate that instruction at the naming level is needed for "second hand." If this objective remains as part of the Unit, revisions will be necessary (with the instruction provided, only one class showed an increase to criterion).
4. Unfortunately, no pretest scores were obtained on the children's ability to count by fives; therefore, there is no way to telling if the increases in performance at post unit in both primary classes was an increase due to instruction. What the data do indicate is that activities on counting by fives (an important skill for time-telling) are necessary, and further that the amount of emphasis placed on this skill in the pilot-version was inadequate. Instruction on this skill should begin early in the Unit so when it is needed for time-telling skills, the instruction will not have to be stopped to teach counting by fives.

Lesson #6 - Second and Second Hand (1 teacher)

A. Purpose, Objectives, Outline, Materials

1. The purpose and objectives were clearly stated, and considered appropriate for all children.
2. It was felt that no children had reached the objectives before the lesson.
3. The materials needed were easily obtained.

B. Pre-activity

1. The activity was helpful structured as it was; the steps in the activity were clear, and the teacher would not change it in any way.
2. Most of the children needed the pre-activity.
   a. Those needing it benefitted from it.
   b. Exciting for those who didn't need it because they could correctly state the answers.
3. Time: 10 minutes
4. The pre-activity was sufficiently explained so as to be directed without difficulty.
5. No suggestions for other pre-activities was made.

C. Tape Presentation

1. The pre-activity adequately prepared the class for the tape.
2. The teacher presentation at the beginning were made. and very good.
3. Introductory Relation: The introductory relation interested the children and got them to look at the picture. They attended to what was said while looking at the picture. -- However, the teacher was unsure whether the cover picture was appropriate.
4. Definitions: The children had obtained definitions for the words by the end of the tape.
   a. The teacher commented that it was the best lesson in a long time.
   b. The children learned a functional definition for the word "second."
5. Elaborations: The elaborations were neither distracting nor helpful. The teacher-directed parts helped the children the most.
6. The children understood the relationship of the words by the end of the lesson and the Summary Relation played a significant part here.
7. All pictures and worksheets were used and felt to be very good.
8. Time: 40 minutes

D. Post-Activities

1. The post-activities strengthened the concepts from the lesson, they were sufficiently explained, and sequenced in the best way.
2. Post-activities #1 and #2 were used; children enjoyed the variation of the first activity and counting seconds in the second.

E. General Comments on the Lesson

1. The teacher was unsure whether her children were ready for the next lesson, and is unsure whether she agrees with the ordering of the lessons.
2. The activities and tape presentation met the objectives of the lesson.
3. All of the children knew the vocabulary concepts at the end of the lesson.
4. The most popular aspect of the lesson was doing things that take a second.
5. The most important aspect in insuring the children learned the concepts was asking questions and asking them to do things that take a second.
6. Time: ("about right"): 3 days - 1 hour, 10 minutes
7. The length of the lesson was about right.

Comments on Book Two

A. Lesson 1 - Hour Hand and Minute Hand

1. There were some problems with this lesson, at least when it was included at this point in the sequence of instruction.
    a. The labels were difficult ones for the children to use, and not really necessary for time-telling.
    b. During this lesson, children exhibited other problems (e.g., difficulty in turning pages, etc.)
2. The Summary Relation didn't really help define the words presented. The children enjoyed the story very much, however. It might be added as a "fun" post-activity for the lesson on "Long Hand" and "Short Hand."

B. Lesson 2 - Telling Time on the Half Hour

1. At first, it was suggested that there should be a separate lesson on the concept "half" of a clock. Continued discussion rejected this suggestion, however.
    a. It seems that a lesson just on "half" would introduce many difficult concepts not needed here.
    b. There should be general activities on "half" which the teacher could select to use if the children needed them.
2. Tape Presentation
    a. It was suggested that the best definition of "thirty" was "when the long hand points straight down to the six."
    b. Elaboration was considered to be fine.
    c. Summary Relation "trick" didn't work - too difficult for children to understand this soon (save for later).
    d. The presentation of the concept that the short hand was "half way between" two numbers created real problems. The idea should be kept in, but the wording should be changed (e.g., "between two numbers"; "past the [3] but not yet to the [4]").
    e. Most problems with skills in this lesson were with setting times rather than with reading them.
3. It was suggested that lesson tests would be very helpful in this unit.
4. The term "half past" should be introduced, at least optionally.

C. Lesson 3 - Hour

1. It was noted here that the sequence of the next three lessons was too much (hour, half hour, hour and half hour).
2. Hour lesson could appropriately be placed after telling time to the hour (Let's Tell Time) and could be used to review and reinforce concepts presented there.

D. Lesson 4 - Half Hour

1. This lesson would be appropriate following "Telling Time on the Half Hour," especially if used to review and reinforce the concepts presented there.
2. Worksheets would be helpful.

E. Lesson 5 - Hour and Half Hour

1. Story was enjoyable, but would be easier for children if reference times (e.g., starting times) were visible throughout the story.
2. The difference between "hour" and "half hour" should be stressed repeatedly throughout the story.
3. Worksheet #4 should be revised so the choices are less difficult (e.g., 6:00, 8:00, 5:30).

F. Lesson 6 - Second and Second Hand

1. It was suggested that this should be an optional lesson.
    a. For some children, the introduction of this concept here might be distracting rather than helpful.
    b. For other children, the lesson might provide an appropriate "break" in the instruction before proceeding to more difficult concepts.
2. It was felt that the story presented in this lesson was not really helpful; a teacher-directed lesson would be more appropriate (teacher could give children many experiences with the duration of a second).

Formative Evaluation of Time With the Clock Unit

Book Three

Lessons 1, 2, 3, 4 & 5 62

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BOOK THREE - LESSON 1: MINUTE
LESSON 2: MINUTES
LESSON 3: TELLING TIME BY FIVE MINUTE INTERVALS
LESSON 4: MINUTES BEFORE
LESSON 5: TELLING TIME TO THE MINUTE

A. Objectives

1. States "60" when asked: "How many minutes are there in an hour?"
2. Tells time in five minute intervals (2:20).
3. Tells time to the quarter hour (3:45).
4. Tells time to the exact minute after (4:11).
5. Tells time to the exact minute before (2:52).
6. Demonstrates the position of the hands at "18 minutes after 3."
7. Demonstrates the position of the hands at "9 minutes before 5."

B. Performance of classes

Pre-Primary

	*School 1			**School 2			*School 3		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. States "60" minutes	0	0	0	0	0	0	0	0	0
2. Tells time 2:20	-	11	22	-	0	0	-	0	0
3. Tells time 3:45	-	11	22	-	0	0	-	0	0
4. Tells time 4:11	-	0	11	-	0	0	-	0	0
5. Tells time 2:52	-	0	0	-	0	0	-	0	0
6. Demonstrates minutes after (3:18)	-	0	11	-	0	0	-	0	0
7. Demonstrates minutes before (5:51)	-	0	11	-	16	0	-	0	0

* Did not receive instruction from this Book.
** Did not receive instruction related to objectives 2-7.

Primary

	***School 1			***School 2		
	Pre	Post Lesson	Post	Pre	Post Lesson	Post
1. States "60" minutes	0	0	22	0	-	58
2. Tells time 2:20	-	0	44	-	-	75
3. Tells time 3:45	-	0	0	-	-	50
4. Tells time 4:11	-	0	0	-	-	58
5. Tells time 2:52	-	0	0	-	-	33
6. Demonstrates minutes after (3:18)	-	8	0	-	-	67
7. Demonstrates minutes before (5:51)	-	0	0	-	-	33

*** Did not receive instruction related to objectives 4 - 7.

C. Interpretation

1. If the fact that there are 60 minutes in one hour is included as an objective in the revision of the Time with the Clock Unit, then additional activities or a revision to the instruction is necessary.

2 - 7. One obvious conclusion from this data is that time telling skills have not been achieved by this population. Another conclusion is (based on the two primary classes who started Book Three instruction) that a couple weeks of instruction is inadequate for teaching time-telling. The scores obtained in the primary class, School 2, reinforce the feeling, however, that time-telling skill can be achieved by EMR students. Based on this feedback, one necessary revision should be the inclusion of additional activities on time telling to raise performance to the criterion level.

Teacher Evaluations of Book Three

Lesson 1 - Minute

A. Purpose, Objectives, Outline, Materials

1. The purpose and objectives were clearly stated, and considered appropriate for "all" of the children.
2. None had reached the objectives before the lesson.
3. The materials needed were easily obtained.

B. Tape Presentation

1. It was not felt that a pre-activity was necessary.
2. The Lesson Organizer was helpful.
3. Introductory Relation - The Introductory Relation interested the children and got them to look at the picture. While looking they attended to what was said.
4. Definitions: In one class, it was felt that the children obtained definitions; in the other class about half did.
   -- It was felt the definitions of "minute," however, were rote for most children.
5. Elaborations were helpful to the children.
6. One teacher was unsure whether the children understood the relationship between the words by the end of the lesson, the other indicated they were understood.
   a. The Summary Relation did play a significant role in insuring the children understood the relationships.
   b. One suggestion to make the summary relation more effective was to have each child work with the clock and move the minute hand.
7. All pictures were good.
8. Time: 30 minutes; 15 minutes

C. Post-Activities

1. The post-activities strengthened the concepts developed in the tape.
2. The post-activities were sufficiently explained and sequenced in the best way.
3. Suggestion: Set a timer for one minute and have children do various things to see how long a minute is.
4. Activities Used:
   a. Activity #1 - good, but could be more exciting.
   b. Activity #2 - good physical activity; children enjoyed.

D. General Comments on the Lesson

1. One teacher agreed with the ordering of the lesson, but the other was unsure.
2. It was felt the activities and tape met the objectives of the lesson.
3. "Most" of the children knew the vocabulary concepts at the end of the lesson.
4. The most popular activity was Post-Activity #2.
5. The most important aspects in insuring the children learned the concepts were the Summary Relation, the reviews and the tape.
6. Time spent on the lesson: (felt to be "about right")
    - a. 3 days - 1 1/2 hours
    - b. 3 days - 45 minutes

Lesson #2 - Minutes

A. Purpose, Objectives, Outline, Materials

1. The purpose and objectives were clearly stated, and appropriate for "most" of the children.
2. It was felt that "some" (1) or "none" (1) of the children had learned the objectives before the lesson.
3. The lesson outline was helpful in planning the use of the activities and tape.
4. The materials were obtained and it was felt that none of them should have been provided.

B. Lesson Format

1. Both teachers liked with the teacher-directed format.
2. Definitions: Children obtained definitions for the words.
    a. One teacher felt all obtained a "functional" definition.
    b. The other teacher felt the definition was rote for half the students and functional for half.
3. Both teachers felt the children understood the relationships between words.
4. Time: 40 minutes (20 minutes twice); 15 minutes
5. Specific Comments:
    a. The lesson format was especially good for this lesson. The teacher also enjoyed giving several examples and not just one for the elaborations.
    b. The shortness of the lesson was good as it left room for review and examples. One teacher commented that the children knew the difference between minute--plural and singular--so the lesson maybe wasn't necessary. The class understood there are five minutes between each number but the teacher felt they could tell time better if they forgot counting by five.

C. Post-Activities

1. The post-activities strengthened the concepts developed in the lesson. They were sufficiently explained and sequenced in the best way.
2. Suggestion for another post-activity: Play games at the board where the children have to fill in the missing numbers by 5.
3. Activities Used:
    a. Activity #1 - good
    b. Activity #2 - very enjoyable; might include more worksheets.
    c. Activity #3 - used by only one; children had problem (too many numbers?).
    d. Activity #4 - worksheets would be helpful.

D. General Comments on the Lesson

1. In one class the children are ready for the next lesson; in the other, the teacher is unsure.
2. All activities met the objections except to "state that there are 60 minutes in one hour" and "that there are 30 minutes in a half hour."
3. "Some" (1) or "All" (1) of the children knew the vocabulary concepts by the end of the lesson.
4. The most popular aspect in one class was counting by 5's around the clock and the least popular in that class was Post-Activity #3, 60 minutes in an hour.
5. Suggestion: Put Post-Activities #3 and #4 some place else as they were to difficult for this class.
6. The most important aspect in insuring the children learned the concepts was Post-Activity #2 - relating 5 minute intervals around the clock.
7. Time spent on the lesson was: (felt to be "about right" or "too long")
   a. 9 days - 4 1/2 hours
   b. 4 days - 1 hour, 10 minutes

Comments on Book Three

General Comments

1. Sequencing changes were proposed to eliminate some of the confusion arising from first teaching time in five minute intervals in a clockwise direction (e.g., 9:55), and then presenting the five minute intervals in a counter-clockwise direction (e.g., five minutes before 10:00 A.M.).
2. Suggested sequence of time telling to minute.
    - a. Five minute intervals after, only to 25 minutes after (right side).
    - b. Five minute intervals before, only to 25 minutes before (left side).
    - c. Exact minutes after, up to 29 minutes after (right side).
    - d. Exact minutes before, up to 29 minutes before (left side).
    - e. Exact minutes on any side (e.g., 10 minutes to = 50 minutes after).
3. It was suggested that the words the children were required to use should be reduced (i.e., anything appropriate should be accepted).

Dimensional Analyses of the Time with the Clock Test

Thirty-nine test items from the Time pilot-test were subjected to dimensional analyses to investigate the structure of the test. Feedback from these analyses was generalized to the components of the instruction (since the test items were obtained from the behavioral objectives of the instruction) and utilized in sequencing the instruction. Two methods were employed in the dimensional analyses: factor analysis and order analysis (Krus, 1974; Krus & Bart, 1974).

The factor analysis was used to determine the orthogonal dimensions inherent in the content covered by the 39 items. The procedure employed was a principal axis factor analysis with Varimax rotation to simple structure after Kaiser normalization (Nie, Bent, & Hull, 1970). Following Thurstone's criterion (Weiss, in press) factors were retained if their eigenvalues were greater than or equal to 1.0.

According to two indices of the factor analysis, the 39 test items did not appear to have a definitive factor structure. First, the factor loadings were quite small, most being under .60 (see Table 1). Second, the five obtained factors accounted for no more than half of the variance of any item and the item-structure variance accounted for was usually less than 25%.

The test items were then order analyzed to ascertain any prerequisite structuring of items, particularly in the expressive vocabulary and skill development areas. The order analysis of the pilot-test items also indicated the lack of a definite structure

Table 1

Results of a principal axis factor analysis of the 39 Time items

	Per Cent of Common Variance Accounted for by the Factor	Eigenvalue	Item Description	Factor Loading
FACTOR 1	22.5	5.5		
			Define hands - size difference	.64
			Utilize morning	.59
			Order parts of the day	.57
			Match dark	.55
			Define clock function	.55
			Label clock	.54
			Utilize face	.53
			Match clock	.50
			Utilize night	.50
			Define morning	.46
			Define night	.44
			Match light	.44
			Define o'clock	.44
			Match before	.43
			Label numbers	.35
			Identify light	.35
FACTOR 2	11.5	2.8		
			Tell time to half hour	.77
			Label minute hand	.66
			Label hour hand	.62
			Demonstrate half hour	.62
			Define half hour	.57
			Tell time to the hour	.52
			Demonstrate relative movement of hands	.40
			Relate afternoon (comes after morning)	.32
FACTOR 3	9.6	2.3		
			Demonstrate part	.77
			Identify different	.56
			Demonstrate second	.54
			Identify half	.32
			Match relative movement of hands	.26
FACTOR 4	9.3	2.3		
			Tell time to the minute	.63
			Match late	.45
			Label second hand	.43
			Label hands	.41
			Match relative duration of hour	.39
			Utilize parts of the day	.36
			Match relative duration of second	.31
FACTOR 5	7.8	1.9		
			Match early	.64
			Identify clock	.39
			Identify after	.28

Table 2

Results of an order analysis of the 39 Time items

	Per Cent of Common Variance Accounted for by the Factor	Item description	Order Loading
FACTOR 1	44.0		
		Label hour hand	.98
		Label minute hand	.85
		Demonstrate rel. movement of hands	.65
		Order parts of the day	.59
		Demonstrate relative movement of hands	.57
		Define half hour	.52
		Define night	.52
		Define o'clock	.49
		Label numbers	.48
		Demonstrate part	.48
		Tell time to the hour	.47
		Match early	.47
		Match before	.47
		Identify different	.46
		Define clock	.46
		Identify after	.45
		Match clock	.45
		Relate afternoon	.45
		Identify light	.45
		Match late	.44
		Label clock	.44
		Identify clock	.44
		Demonstrate o'clock	.42
		Utilize morning	.41
		Match relative duration of second	.41
		Utilize night	.41
		Define morning	.40
		Match dark	.40
		Label hands	.39
		Match light	.39
FACTOR 2	21.6		
		Identify half	.78
		Tell time to the minute	.73
		Label second hand	.69
		Demonstrate half hour	.49
		Tell time/half hour	.39
		Demonstrate second	.36
FACTOR 3	18.3		
		Utilize face	.99
		Match relative duration/hour	.45
		Utilize parts of day	.40

(see Table 2), thus paralleling the results of the factor analysis. The order analysis produced one large factor which was primarily a time-telling skills factor. The items in the factor were prerequisite in a general way for Factors 2 and 3 which contained the most difficult items of instruction, such as telling time to the half hour and to the minute.

Discussion

The data presented in the Results section of this paper were used to revise the Time with the Clock Unit into a version which would undergo large-scale field-testing. Each of the feedback sources reported here (e.g., testing, teacher evaluation forms, and Teacher Review Board meeting) provided important information during the formative evaluation of the Unit. For example, the test data identified specific areas where instruction was weak. The evaluation forms tapped the teachers' immediate reactions to each aspect of the lessons in the Unit, and the Teacher Review Board meeting allowed the teachers to discuss their reactions with project directors and with other teachers, and to make final recommendations for revision.

Six aspects of the pilot-test version of the Time with the Clock Unit were evaluated, as specified in the formative evaluation design (cf. Krus, Thurlow, Turnure, Taylor, & Howe, 1974): 1) Need for instruction, 2) Instructional effectiveness, 3) Design of the materials, 4) Content, 5) Sequencing, and 6) Test instruments. Each feedback source provided specific information about one or more of these aspects, and generally, every aspect was evaluated on the basis of feedback from several sources. In all cases, the information from all sources was reviewed by project directors and by individuals responsible for revising the Unit. This composite evaluation of the pilot-test version was then used to revise the Unit.

The need for a complete program of instruction to teach clock-related concepts and skills to EMR children was supported by the pretest data obtained during the formative evaluation. For example, the need for basic pre-clock time concepts (day, night, etc.) was evaluated in the three pre-primary classes. Data revealed that 58% could label a morning picture and provide an adequate description of morning. Fifty-four percent could label a night picture, but only 38% could provide an adequate description of night. Analysis of data also revealed that of all the students who were pretested (pre-primary and primary), only 48% noted the size difference in the hands of the clock. It was further found that only 52% of the students could correctly tell time on the hour and a mere 19% could tell time to the half hour. Clearly, instruction was needed, and teachers reconfirmed initial indications that available materials dealing with time and the clock were inappropriate for their children.

The instructional effectiveness of the Time with the Clock Unit was given major attention during the formative evaluation stage, and served as the primary basis for revision of the instruction. All stated objectives from the Unit were tested in both pretests and posttests. In addition, testing occurred throughout the instruction (i.e., post-lesson tests), with objectives not reaching the 80% criterion level being retested to determine if related instruction affected mastery.

Data from all of these tests were used to determine the instructional effectiveness of the two experimental lessons being evaluated. Evaluation of post-lesson data indicated that in Version A classes only two to four of the ten objectives were met. In the Version B class, five out of ten objectives were met immediately after the lesson. This information, along with the impressions presented at the Teacher Review Board, led to the decision to incorporate Version B into the Time with the Clock Unit. Version B presented day as the time when it is light outside and night as the time when it is dark outside.

In addition, data from the tests pointed to specific areas where instruction had not been effective. For instance, data revealed that the objective of describing morning did not reach criterion after either of the experimental lessons (class performance was at the 50% level) and clearly indicated that revisions were necessary to the instruction on this concept.

Data related to several prerequisite concepts were also obtained. Posttest data indicated that only 42% of the preprimary children showed an understanding of the prerequisite concept "before." Data from the primary classes indicated that criterion had been reached by these classes. Clearly, the instruction provided was at an effective level for children of primary class age and ability. It seems that the instruction on prerequisite concepts should now be revised with the abilities of pre-primary level children considered.

The evaluation of the instructional effectiveness of the Time with the Clock Unit also identified weak performance related to time-telling skills. None of the objectives tested relating to time-telling were at criterion level when posttested. The posttesting mastery levels of 60% (tells time 2:20) and 28% (tells time 3:45) on the time-telling by five minute interval items by the two primary classes receiving the instruction indicated that additional instruction related to this skill was needed. A suggestion to expand the use of worksheets in order to reinforce time-telling skills was made and followed up in the revised version of the Unit.

Specific problems in the instruction, such as those noted above, were subjected to careful scrutiny to determine whether the problems arose from testing procedures, instructional content, the sequence of instruction, or from the design of the materials themselves. All sources of feedback were consulted to make final decisions as to the revisions which should be made in the Time with the Clock Unit.

Several major revisions in the design of the materials were first assessed in the formative evaluation of the Time with the Clock Unit and provided important feedback for the development and revision of the other units in the Money, Measurement and Time Program. Prior to the development of the Unit, instruction had been organized into separate levels of instruction (Pre-primary and Primary). Feedback obtained from the formative evaluations of the Money and Length Units (Thurlow, Krus, Howe, Taylor, & Turnure, 1974 a,b) suggested that such organization was inappropriate. Pilot-tests confirmed the findings that 1) the lower level of instruction was often needed by primary children, and 2) pre-primary children could often proceed to the "primary" level of instruction. Therefore, a change to a sequential organization was made in the development of the Time with the Clock Unit. In the pilot-testing of the Unit, this organization was found to be highly useable by the teachers. A generally positive response was noted from all sources of feedback and as a result all instruction in the Money, Measurement and Time Program was revised to sequential organization.

Another revision which was first assessed in the formative evaluation of the Time with the Clock Unit was the inclusion of an introductory tape lesson with the Unit, and the use of a central character to enhance the effectiveness of the tape presentations (and specifically the "introductory relation"). These suggestions were implemented as a result of the feedback obtained from the previously evaluated units (Thurlow, Krus, Howe, Taylor & Turnure, 1974 a,b,c). At the Teacher Review Board meeting for the Time with the Clock Unit, the teachers commented that they found the introductory tape lesson a valuable and effective stimulus for motivating the children. The central character, Mr. Time, was found to be very effective and also highly motivating. The introduction of a Unit character led to highly effective introductory relations, unlike those of the first unit pilot-tested (Weight Unit; cf. Thurlow, Krus, Howe, Taylor & Turnure, 1974c), where the teacher's felt the introductory relations definitely failed to obtain the children's attention and generate interest in the remainder of the presentation. Because of its effectiveness in the Time with the Clock Unit, the inclusion of an introductory tape lesson and a central character was incorporated into the revisions of all the instructional units.

A third change in the design of the materials which was made to increase their appropriateness for EMR children involved a revision in the picture books which accompanied the tape presentations. The evaluations of the Money, Length, and Weight Units (Thurlow, Krus, Howe, Taylor, & Turnure, 1974 a,b,c) indicated that the use of Big Picture Books for lower level instruction might be more effective than the use of individual student texts at this level. This recommendation was first implemented in the materials used in the pilot-test of the Time with the Clock Unit. Although the teachers noted some difficulty in manipulating the Big Picture Books (the books were printed on sheets of paper bound with two rings) and the potential disadvantages of using this type of book with large groups of children, their use was generally viewed as favorable. The teachers commented that the Big Pictures were "very effective," especially for younger children. Based on this feedback, the use of Big Picture Books for initial levels of instruction was incorporated into the field-test materials of all units.

Several revisions were made in the content of the Time with the Clock Unit as a result of the formative evaluation. The major structural change of this Unit was the decision to include instruction dealing with pre-clock time concepts which had been tested in the experimental lessons (day, night, etc.).

Evidence from the testing of objectives and the Teacher Review Board were the basis for this decision. Two approaches to teaching these concepts were tested in this evaluation and the approach which presented day as the time when it is light outside and night as the time when it is dark outside was found to be instructionally the most effective approach.

As noted previously, instruction provided in the experimental lessons on the concept "morning" was not effective. An examination of the content was conducted. Investigation of the lesson evaluation forms and the discussion at the Teacher Review Board meeting revealed that the concept was not given sufficient elaboration. It was noted that the children became confused because the tape seemed to imply that lunch came right after morning. This could account for the low performance level found at posttesting. Revisions to the instruction on morning were thus indicated and undertaken.

Another major revision involved in the Unit was the expansion of instruction on the skill of counting by fives. Posttesting on this skill revealed that the students had not mastered counting by fives around the clock. In the revised version, this instruction is initiated six lessons before time-telling is introduced, rather than simply two lessons before the lesson on time-telling by fives, as it was in the pilot-test version.

Other aspects of the content which were expanded in the field-test version included the following: Activities on the concept "one-half," a lesson on "long hand" and "short hand,"

and a lesson, rather than activities, on "light" and "dark." Unfortunately, all the specific content changes and additions made to the pilot-test version of the Time with the Clock Unit are too numerous to discuss in detail here. Many of the changes made can be identified by comparing the pilot-test version with the revised field-test version. Investigation of Appendix 4, which describes the revised version of the Time with the Clock Unit (in comparison with Appendix 1) will also reveal many of the content changes which resulted from the formative evaluation of the Unit.

The sequencing of instruction in the Time with the Clock Unit was highly related to its content, and changes were generally made in conjunction with changes in content. Appendix 4 (again, in comparison with Appendix 1) provides an excellent picture of the lesson sequence changes made in the Unit as a result of this evaluation. From the order analysis conducted (see Table 2), lessons were rearranged so as to teach prerequisite vocabulary items before more complex time-telling skills. The analysis confirmed the belief that the pre-clock time vocabulary words were a necessary foundation for time-telling skills. This parallels Bateman's (1961) finding that children acquire vast, general ideas about time before time-telling specifics. With the addition of instruction on pre-clock time to the Unit as another book (Book One), the three books of pilot-test Time with the Clock instruction were expanded to four books. Basically, the pilot version Book One instruction became Book Two, the pilot version Book Two instruction became Book Three, and the pilot version Book Three became Book Four.

Along with the inclusion of additional lessons in all books of instruction, the sequencing within books also underwent changes. For example, suggestions were made at the Teacher Review Board meeting to include all instruction dealing with the duration of an hour after the first introduction to time-telling on the hour. In the pilot-test version, the instruction dealt with telling time on the hour and the half hour, and then proceeded to the duration of a half hour. The duration of an hour was presented next. To eliminate the confusion which resulted when the concepts were presented in this sequence, the concept of "hour" was placed in Book Two after time-telling on the hour and instruction on half hour was included in Book Three after time-telling on the half hour.

Also, within lessons, sequencing was changed to include more instruction on necessary prerequisite concepts (e.g., number recognition 1-12) and in numerous cases, activities were added or removed to improve sequencing (e.g., initiating instruction on counting by fives in the beginning of Book Three).

The most extensive expansion in instruction was made in Book Four. Posttest scores revealed that instruction in the pilot-test version of the Unit was insufficient and ineffective for teaching complex time telling (e.g., time-telling to any minute). Two changes in the instructional sequencing were made.

First, the instruction was reordered into smaller instructional steps (e.g., first instruction dealing solely with the right side of the clock -- "after" times, then instruction dealing solely with the left side of the clock -- "before" times, and finally, instruction on time telling on both sides -- "after"). Second, instruction concerned with time telling was sequenced to develop each of these three steps by initially teaching telling time by five minute intervals then progressing to telling time to the exact minute.

Further, the formative evaluation of the Time with the Clock Unit served to substantiate several instructional sequences that were utilized in the pilot-test version. For example, the instructional development of time telling on the hour prior to time-telling on the half hour, and instruction on reading times on clocks before demonstrating times, both proved to be effective instructional sequences.

A final outcome of the formative evaluation of the Time with the Clock Unit related to testing procedures. Teacher feedback on test items and the test data, along with the revisions in sequence and content, allowed for the revision of the 50-item pilot-test instrument to a 30-item test for field-test purposes (see Appendix 5).

Unlike the organization of the other tests developed from formative data for field-test purposes, the Time test included one 30-item test. In the Money, Length, and Weight Units, two tests were developed -- one dealing primarily with expressive abilities and the other with skill-related abilities. The results of the factor analysis and the order analysis conducted on the time pilot-test questions, however, revealed no distinction between the expressive and skills items. The order analysis indicated that this was due to the fact that the expressive items were presented primarily at the beginning of the instructional Unit, with the latter part of instruction dealing primarily with skill development.

Revisions in the design, content, and sequencing of the Time with the Clock Unit, and in the accompanying tests, grew directly out of the formative evaluation of the Unit. Although this evaluation represented a large and somewhat time-consuming step in the overall evaluation design of the Vocabulary Development Project (Krus, Thurlow, Turnure, Taylor & Howe, 1974), the value of including this step in the development and evaluation process was verified by the relatively final and extremely effective Time with the Clock Unit which resulted (Krus, Thurlow, Turnure, & Taylor, 1974). The formative evaluation process employed here is one which has been used to evaluate other instructional units by the Vocabulary Development Project, and one which would be a valuable addition to many other development and evaluation projects.

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Footnotes

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APPENDICES

1. A Description of the Pilot-Test Version of the Time with the Clock Unit
2. Time with the Clock Unit Pilot-Test Questions
3. Sample Evaluation Form
4. A Description of the Revised Version of the Time with the Clock Unit
5. Revised Time with the Clock Unit Test

Appendix 1

A DESCRIPTION OF THE PILOT-TEST VERSION OF THE TIME WITH THE CLOCK UNIT

The Time with the Clock Unit introduces time concepts which are related to the use of the clock. The pilot version of the Unit consists of two versions of Experimental Lessons which develop prerequisite concepts like "time," "day," etc. and three books of instruction which introduce the clock (its parts and functions) and teach time telling skills.

Experimental Lessons: Version A

The two experimental lessons are designed to provide the children with an introduction to the basic of time concepts - the day, and certain times of the day (morning, afternoon, and night).

Lesson 1: "A Day"

Vocabulary Words: DAY (today)

The children are taught the concept of a day as a 24-hour period ("the time from when you wake up one morning until you wake up the next").

Lesson 2: "Time of a Day"

Vocabulary Words: MORNING, AFTERNOON, NIGHT (tonight)

The children are taught that there are three times of a day - morning, afternoon, and night.

Experimental Lessons: Version B

The two experimental lessons are designed to provide the children with an introduction to the basic time concepts day and night, and two times of the day (morning and afternoon).

Lesson 1: "Day and Night"

Vocabulary Words: DAY, NIGHT, (today, tonight)

The children are taught the concept of "day" as just the part of a 24-hour day when it is light outside and "night" as the time when it is dark outside.

Lesson 2: "Times of the Day"

Vocabulary Words: MORNING, AFTERNOON

The children are taught the times of the day as related to the definition of day - it is light outside during the morning and afternoon.

Book One

Book One of the Time with the Clock Unit serves as a starting point for the young child in the complex area of time telling. This book provides the children with an introduction to the need to tell time (through the concepts "early," "on time," and "late"), the clock and its parts ("face" and "hands"), and to beginning time telling (using the work "o'clock"). There are 3 lessons in this book.

Lesson 1: "Early, On Time, and Late"

Vocabulary Words: EARLY, ON TIME, LATE

The children are taught what it means to be early, on time, and late. This lesson is designed primarily to introduce the children to the need for being able to tell time. Pre-activities review the concepts "before" and "after" as related to time.

Lesson 2: "The Clock"

Vocabulary Words: CLOCK, FACE, HANDS

The children are taught basic recognition of the clock and its parts. They learn that a clock is used to tell time and that every clock has two hands and numbers on its face.

Lesson 3: "Let's Tell Time"

Vocabulary Word: O'CLOCK

The children are taught to tell time on the hour (using the word "o'clock" to tell time) without reference to the fact that the time is "on the hour." They also learn to demonstrate the position of the hands for any given o'clock.

Book Two

Book Two of the Time with the Clock Unit presents the basic terms encountered in telling time, and identifies introductory activities for beginning time telling activities related to these terms.

The Book begins by teaching labels for the hands on the clock and time telling on the half hour. It then provides lessons on the general terms used in time telling (hour, half hour, second) in relation to the clock. There are 6 lessons in Book Two.

Lesson 1: "Hour Hand and Minute Hand"

Vocabulary Words: HOUR HAND, MINUTE HAND

The children are taught "hour hand" as a synonym for the short hand and "minute hand" as a synonym for the long hand. They are also shown, in a post-activity, the movement of the hour hand and minute hand in relation to one another.

Lesson 2: "Telling Time on the Half Hour"

Vocabulary Word: THIRTY

The children are taught to tell time on the half hour using the word "thirty." As with the instruction on time telling on the hour, no reference is made here to the fact that the time is "on the half hour."

Lesson 3: "Hour"

Vocabulary Word: HOUR

The children are taught the concept of an hour with respect to the change in the position of the hour hand and minute hand.

Lesson 4: "Half Hour"

Vocabulary Word: HALF HOUR

The children are taught the concept of a half hour with respect to the change in the position of the hour hand and minute hand from time on the hour to time on the half hour.

Lesson 5: "Hour and Half Hour"

Vocabulary Words: HOUR, HALF HOUR

The children are taught the relative duration of an hour and a half hour in a direct continuation of Lessons 3 and 4. Post-activities relate the relative duration to the change in the position of the hour hand and minute hand in one hour and in a half hour.

Lesson 6: "Second and Second Hand"

Vocabulary Words: SECOND, SECOND HAND

The children are taught the duration of a second. In the post-activities, they are taught recognition of the second hand and also, its rate of movement compared to that of the hour hand and minute hand.

Book Three

Book Three of the Time with the Clock Unit is concerned with the basic terms and skills involved in more complex time telling (i.e., telling time to the minute).

Instruction proceeds by presenting the concept of one minute, and then progresses to counting minutes, telling time on exact five minute intervals, and finally to telling time to any minute. Book Three consists of 5 lessons.

Lesson 1: "Minute"

Vocabulary Word: MINUTE

The children are taught the concept of one "minute" in relation to the clock (i.e., it takes the minute hand one minute to move from one mark on the clock to the next).

Lesson 2: "Minutes"

Vocabulary Word: MINUTES

The children are taught that more than one minute is referred to as "minutes." The lesson also prepares the children for telling time in five minute intervals.

Lesson 3: "Telling Time by Five Minute Intervals"

Vocabulary Words. MINUTES AFTER

The children are taught to tell time when the clock is set at any five minute interval. The words "minutes after" are used to tell the time.

Lesson 4: "Minutes Before"

Vocabulary Words: MINUTES BEFORE

The children are taught to tell time using the words "minutes before." As in Lesson 3, this is done in minutes before the hour in five minute intervals only.

Lesson 5: "Telling Time to the Minute"

Vocabulary Words: MINUTES AFTER, MINUTES BEFORE

The children are taught time telling to any minute. The lesson consists of two sets of activities. The first present the developmental steps for teaching telling time to any minute, using the words "minutes after." The second set presents the developmental steps for teaching telling time to any minute, using the words "minutes before."

Appendix 2

TIME WITH THE CLOCK UNIT PILOT-TEST QUESTIONS

Pilot Study
Testers Manual

1. Define day

<table>
<tr><td>DO:</td><td>SAY: What is a day?</td></tr>
<tr><td colspan="2">Guide: This is a general information question so record all relevant responses. Do not allow the child to ramble on; repeat the question if this should happen.</td></tr>
</table>

2. Define day

<table>
<tr><td>DO:</td><td>SAY: Can it be dark outside during the day? Why?</td></tr>
<tr><td colspan="2">Guide: Informational question: day may have 2 meanings - a day as 24 hours or a day as when it's light outside. Record responses completely.</td></tr>
</table>

3. Demonstrate part

<table>
<tr><td>DO: Set picture of pie in front of child and hand him a crayon.</td><td>SAY: Use this crayon to color in one part of this pie.</td></tr>
<tr><td colspan="2">Guide: This question tests an understanding of part; therefore, no other prompts are acceptable.</td></tr>
</table>

Remove picture.

4. Utilize parts of the day

<table>
<tr><td>DO:</td><td>SAY: What are the names of the parts of the day?</td></tr>
<tr><td colspan="2">Guide: This is a difficult question. The three correct responses are listed on the score sheet - all responses should be noted. Prompt: What's the name of one time of the day? Can you think of any other times of the day?</td></tr>
</table>

5. Ordering parts of the day

a.

DO: Use cards with words morning, afternoon and night as specified in the question.	SAY: I have three cards and they each have a word on them. I'll tell you what they say and then we'll play a game to see if you can remember all of them. This one with the big N says night. And this one with a big M says morning and this one with the A says afternoon.
Guide: This part of the question is to teach the child how to "read" the cards. Check this by asking the following: Point to the card that says afternoon. Point to the card that says night. Which card says morning? Review once or twice if necessary. If this task appears too difficult, do not continue to b or c.	

b.

DO: Hand cards to child.	SAY: There's a special order that they belong in. Now I want you to take the cards and put them in order that they come during the day.
Guide: Number the responses in order of the child's response (1, 2, 3). If child does not response, continue with c.	

c.

DO: Cards are still out.	SAY: Which one happens first? (Pause) Put that here (point out a place for child).
Guide: Number (1, 2, 3) according to child's response.	

Remove cards.

6. Utilize morning

DO: Show picture of boy waking up.	SAY: What part of the day do you think it is in this picture?
Guide: Prompts: What time of the day does it look like in this picture? Is it morning, afternoon, or night?	

7. Define morning

DO: Same picture is visible as used in above question.	SAY: What do you see in this picture that shows it is morning?
Guide: Prompt: Look at this picture carefully and tell me why it's morning. Can you tell me more about the picture? What else makes you think it's morning?	

Remove picture.

8. Identifies light

DO:	SAY: Is it light outside or dark outside right now?

9. Relate afternoon

DO:	SAY: What time (part) of the day comes after morning?

10. Utilize night

DO: Show picture of boy sleeping.	SAY: What time of the day do you think it is in this picture?
Guide: Make sure the child is attending to the picture. If the child does not respond with either morning, afternoon, or night, prompt with: "Is it morning, afternoon or night?"	

11. Define night

DO:	SAY: What are some things people do at night that they don't do at any other part of the day?
Guide: Do not allow the child to ramble on; repeat the question if this should happen. Prompts: What else? Is there anything else?	

12. Match dark

DO:	SAY: Is it usually light outside or dark outside at night?

13. Match early

DO:	SAY: When you get to school before it starts, are you getting to school early or late?
Guide: Before is an important concept in this question. If the child does not respond and you prompt by asking the question another way, make sure before is included.	

14. Match late

DO:	SAY: When you get to a movie after it starts, are you getting there early or late?
Guide: After is an important concept in this question. If the child does not respond and you prompt by asking the question another way, make sure after is included.	

15. Match clock

DO: Show picture of clocks and distractors (Picture A).	SAY: Point to the pictures that show what you would use to find out the time.
Guide: Record exactly what child points to as indicated on the score sheet.	

Remove Picture.

16. Label clock

DO: Show picture of clock.	SAY: What is this?

Remove picture.

17. Identify clock

DO: Show picture of clocks and distractors. (Picture B)	SAY: Look at all of these pictures. Find the pictures of the clocks and point to them.
Guide: Record exactly what child points to as indicated on the scoresheet.	

18. Define clock

DO: Remove pictures	SAY: Why do people look at clocks?
Guide: If child does not respond appropriately, prompt with: What are clocks used for? (An appropriate response: to tell time)	

19. Utilize face

DO: Move hand over face of toy clock.	SAY: What's the whole front side of the clock called?
Guide: If the child does not respond appropriately, prompt with "What's the part of the clock you look at to find out the time?"	

20. Label hands

DO: Point to hands of toy clock.	SAY: What are these called?
Guide: If the child does not respond appropriately, prompt with, "What do we call the things that point to the numbers?"	

21. Label numbers

DO: Point to numbers on clock.	SAY: And what are these called?

Remove clock.

22. Identifies different

DO: Show picture with boxes.	SAY: There are 3 things on this page. Point to the one that is different. Which one is different?

23. Defines hands

DO:	SAY: What do the two hands of the clock look like?
Guide: This question can have various answers dealing with the size of the hands - small and big, long and short, little and big, etc. Record any other responses that are relevant. If the child has not noted difference ask: "How are the two hands of the clock different?"	

24. Tells time/hour

DO: Show clocks with times.	SAY: I'll show you some clocks and I want you to tell me what time they say.
Guide: If child responds 3 or 7 ask: 3 what? 7 what? Only record phrase "o'clock" if it is used correctly.	

25. Demonstrate o'clock

DO: Use the clock.	SAY: Move the hands on this clock so it says 5 o'clock.
Guide: The children are taught exact placement of the hands any deviation should be recorded by drawing in placement by child on the score sheet clock.	

26. Defines o'clock

DO: No clock visible.	SAY: At 4 o'clock, where is the long hand pointing to?
Guide: If the child understands the concept "o'clock" this question should elicit the response "to the 12". Prompt: What number is the long hand pointing to?	

27. Relates on time

DO:	SAY: What would you have to do to make sure you always get to places on time?
Guide: The answer sought is: Use a clock to tell time but record all responses. If child seems confused repeat question. or If you wanted to make sure you were going to be on time - like for a school bus - what is a good thing to do. OR record on score sheet any prompt used - it is essential that the concept on time is included in prompting.	

28. Match before

DO:	SAY: Now I want you to stand up, turn around, and sit down. (When child completes task. ASK:) What did you do BEFORE you turned around?
Guide: The child should respond "stood up." If child is having difficulty repeat the complete question. Record exactly what the child does and says.	

29. Identifies after

DO: Show series of 3 pictures of girl getting hair cut.	SAY: This girl is getting her hair cut. Point to the picture that shows her hair AFTER her haircut.
Guide: Emphasis should be placed on "after".	

30. Match light

DO:	SAY: Is it light outside or dark outside in the afternoon?

(add 1) Labels minute hand

DO: have toy clock handy in case you use the prompt.	SAY: What's another name for the long hand?
Guide: The desired response is minute hand. If the child does not respond, point to the long hand on the clock and ASK: (PROMPT) "What else do we call this hand?"	

(add 2) Labels hour hand

DO: have toy clock handy in case you use the prompt.	SAY: What's another name for the short hand?
Guide: The desired response is hour hand. If the child does not respond point to the short hand on the clock and ASK: (PROMPT) "What else do we call this hand?"	

31. Match/relative movement of hands

DO:	SAY: You know that both hands on the clock move, right? Which hand moves more the minute hand or the hour hand?
Guide: prompt: Which hand moves faster - the minute hand or the hour hand?	

32. Demonstrate/relative movement of hands

DO: Use toy clock and place hour hand (short one) on 3.	SAY: This clock says 3 o'clock. Now, I'm going to move the minute hand all the way around the clock. Show me what would happen to the hour hand.
Guide: Describe child's response. Prompts: Would the hour hand move? Where would the hour hand move to?	

33. Tells time/half hour

DO: Show toy clock with hands reading 1:30.	SAY: What time does this clock say?

34. Demonstrate half hour

DO: Hand child toy clock with hand set randomly.	SAY: Move the hands on this clock to show 5:30?

Remove clock.

35. Define half hour

DO:	SAY: Where does the minute hand point to when it's 4:30?
Guide: Prompts: What number does the minute hand point to when it's 4:30?	

36. Identify half

DO: Show picture of pie and hand child a crayon.	SAY: Use this crayon to color in one half the pie. Color half the pie.

Remove picture.

37. Match (relative duration) hour

<table>
<tr><td>DO:</td><td>SAY: Which is a longer time, an hour or a half hour?</td></tr>
<tr><td colspan="2">Guide: Prompts: Which lasts longer - an hour or a half-hour? Which takes more time - an hour or a half hour?</td></tr>
</table>

38. Label second hand

DO: Show picture of clocks with all 3 hands.	SAY: This clock has a minute hand and an hour hand, but there's another hand, too. What's the name of this other hand?

Remove picture.

39. Match (relative duration) second

DO:	SAY: Which is shorter, a second or a minute?

40. Demonstrate second

<table>
<tr><td>DO:</td><td>SAY: Show me something that you can do in a second?</td></tr>
<tr><td colspan="2">Guide: Such things as wink of eye, snap finger, stand up. Record response exactly.</td></tr>
</table>

41. Fact/hour

DO:	SAY: How many minutes are there in an hour?

42. Tell time (minute)

DO: Show clocks reading:
2:20
3:45
4:11
2:52

SAY: Tell me what time each of these clocks say.

GUIDE: Prompt: What does this one say.

Record exactly what child says. For example, whether "three forty-five" "quarter to four" or "fifteen minutes to four" are correct for 3:45

After responding one way prompt with: Can you think of another way to read this clock?

Note all responses and all prompts that you use.

43. Demonstrate minutes after

DO: Hand child toy clock

SAY: Move the hands on this clock to show 18 minutes after 3.

GUIDE: The minute hand should be pointing to 18, therefore, be explicit on the score sheet when recording child's response.

44. Demonstrate minutes before

DO: Hand child toy clock

SAY: Move the hands on this clock to show 9 minutes before 5.

GUIDE: The minute hand should be pointing to the 51, therefore, be explicit on the score sheet when recording child's response.

45. Describe what's missing

DO: Show picture of clock without the numbers and only one hand.

SAY: What's missing from this clock?

GUIDE: Record child's response in full.

46. Counting minutes by 5

DO: Show picture of large clock.

SAY: There are 60 minute markings on this clock. I want you to show me the fast way to count the minutes around the clock. Count out loud and show me as you count.

GUIDE: The desired response is for the child to count 5, 10, 15, 20 etc. while pointing to the numbers on the clock. PROMPT: Point to the large numbers as you count the minutes around the clock.

Appendix 3

SAMPLE EVALUATION FORM

TIME WITH THE CLOCK
Book One

Teacher____________________

School____________________

Lesson # 3 Title Let's Tell Time

Date____________________

Purpose, Behavioral Objectives, Lesson Outline, and Materials Needed

Purpose and Behavioral Objectives

Were the purpose and objectives stated clearly enough for you to understand the goal of the lesson?

	None	Some	Most	All
For how many children in your class were the purpose and objectives appropriate?	( )	( )	( )	( )
How many children did you feel had reached the objectives before the lesson was presented?	( )	( )	( )	( )

Lesson Outline

Did the lesson outline help you in planning the use of the lesson activities and the tape presentation?

How could it be improved to be more helpful to you?

Materials Needed

Were you able to obtain the materials that were required?

Did you feel any of the required materials should have been provided?

Lesson #_____

Pre-Activity

This pre-activity was designed to be structured for you.

	Yes	No	Unsure
Was it helpful for the activity to be as structured as it was?	( )	( )	( )
Was the activity structured enough?	( )	( )	( )
Were the steps in the activity clear? Could you see the rational behind the steps?	( )	( )	( )

Are there any ways in which you would change the structure of the activity?

	None	Some	Most	All
How many children in your class did you feel needed the pre-activity?	( )	( )	( )	( )
Of the children who needed the pre-activity, how many benefitted from it?	( )	( )	( )	( )

What was the effect of the pre-activity on those children who you felt did not need the pre-activity?

How long did it take your class to complete the required pre-activity?

Was the Pre-activity sufficiently explained so that you could direct it without difficulty?

Are there any other activities which you feel should be included as pre-activities?

Lesson #_____

Tape Presentation

	Yes	No	Unsure
Did the pre-activity adequately prepare your class for the tape presentation?	( )	( )	( )

Introductory Relation

	Yes	No	Unsure
Did the introductory relation interest the children and get them to look at the cover picture?	( )	( )	( )
While looking at the cover picture, did the children attend to what was said?	( )	( )	( )
Did you feel the cover picture was appropriate for the introductory relation and the tape presentation as a whole?	( )	( )	( )
Did the introductory relation succeed in preparing the children for what the lesson was designed to teach them?	( )	( )	( )
Did the introductory relation prepare you for the tape presentation?	( )	( )	( )

Presentation of Words

	Yes	No	Unsure
Were the words presented in the best possible order?	( )	( )	( )
	Always	Sometimes	Not Usually
Did you feel there was a smooth flow from one word to the next in the tape presentation?	( )	( )	( )

(Definitions): Following the tape presentation, did you feel the children had obtained definitions for each of the words presented in the tape?

( ) Yes ( ) No

List each word in the lesson and the type of definition you feel most of the children in your class obtained for that word (i.e., none, rote, non-generalizable, functional, etc.).

(Elaborations): Overall, were the elaborations (stories), distracting, or helpful to the children?

( ) Helpful ( ) Distracting ( ) Neither

List any elaborations which you felt were especially superior or inferior.

(Relations): Did you feel the children understood the relationship between the words by the end of the tape presentation?

( ) Yes ( ) No ( ) Unsure

Do you think the Summary Relation at the end of the tape presentation played a significant role in insuring that the children understood the relationships?

( ) Yes ( ) No ( ) Unsure

Is there any form (e.g., story, questions, physical activity) that you think would have made the Summary Relation more effective or interesting?

List the numbers of the pictures and/or worksheets used during the tape presentation and describe their appropriateness (e.g., very good, adequate, distracting, inappropriate, unnecessary).

How long did it take your class to complete the tape presentation?

Lesson #_____

Post-Activities

(General Comments):	Yes	No	Unsure
In general, did you feel that the post-activities strengthened the concepts developed in the tape presentation?	( )	( )	( )
Were the post-activities sufficiently explained so that you could direct them without difficulty?	( )	( )	( )
Were the post-activities sequenced in the best way? (If not, how would you sequence them?)	( )	( )	( )

Are there any other activities that you feel should be included in the post-activities?

(Specific Comments): A number of post-activities were suggested to you. Please list each activity you used by kind (Required or Optional) and number, and give your opinion of the activity and how you think it might be strengthened (include, if possible, the amount of time spent on each activity). It is important that we get your specific comments on every activity that you have used. Feel free to use as much paper as necessary.

Lesson # _____

Supplementary Activities

(General Comments):

	Yes	**No**	**Unsure**
Did you feel the purpose and placement of the supplementary activities were appropriate?	( )	( )	( )
In general, did you find the suggested activities helpful in presenting the target concepts?	( )	( )	( )
Were the activities sufficiently explained so that you could direct them without difficulty?	( )	( )	( )

	None	**Some**	**Most**	**All**
For how many children in your class were the activities appropriate? Explain:	( )	( )	( )	( )

Are there any other activities that you feel should be included in the supplementary activities?

(Specific Comments): A number of supplementary activities were suggested to you. Please list each activity you used by number, and give your opinion of the activity and how you think it might be strengthened (include, if possible, the amount of time spent on each activity). It is important that we get your specific comments on every activity that you have used. Feel free to use as much paper as necessary.

Lesson #_____

General Comments on the Lesson

Please look at the page in your Teacher's Manual which shows the vocabulary words for the unit (page ii). Note the position of this lesson within the unit.

	Yes	No	Unsure
Does this chart help you to understand the place of this lesson in the whole sequence of the unit?	( )	( )	( )
Do you feel that the children in your class are now educationally and motivationally ready for the next lesson in the unit?	( )	( )	( )
Are there any words that you think the children should have been taught prior to this lesson? If yes, what are they?	( )	( )	( )
At this point, do you agree with the ordering of the lessons?	( )	( )	( )

If not, how would you change the sequence of the lessons (or, is there a lesson not included here that you feel is needed and should be inserted before this lesson?).

Look at the purpose and behavioral objectives for the lesson. Did the activities and tape presentation of the lesson meet these objectives?

How many children did you feel knew the vocabulary concepts at the end of the complete lesson?

( ) None ( ) Some ( ) Most ( ) All

Did the children enjoy the lesson?

What aspect of the lesson was most popular?

What aspect of the lesson was least popular?

Are there any changes or additions you would recommend to enhance the children's enjoyment and/or learning without distracting from the lesson?

If you had to pick the one aspect of the lesson which you felt was the most important in insuring that the children learned the concepts presented, what would you select in this lesson?

How much actual time did you spend on this lesson?

Total number of days? __________

Approximate total amount of time? __________

What was your feeling about the length of this lesson?

( ) Too long ( ) Too short ( ) About right

Appendix 4

A DESCRIPTION OF THE REVISED VERSION OF THE TIME WITH THE CLOCK UNIT

The Time with the Clock Unit consists of four books of instruction which develop time concepts by beginning with general time terms (e.g., day, night, morning); then proceeding to the recognition and function of the clock, to time telling on the hour, on the half hour, and telling time in minutes. The four books have been designed for sequential use. The major focus of each book, along with a summary of each of the lessons, is provided below:

Book One

Book One of the Clock Unit presents several general terms which do not require the use of the clock. The instruction stresses language development, and is intended to make the children more aware of time at beginning descriptive levels. There are 5 lessons in this book.

The book begins by providing an introduction to several basic time concepts, ranging from day and night to parts of the day, and finally to the need to be able to tell time (through the concepts "early," "on time," and "late").

Lesson 1: "Light and Dark"
Vocabulary Words: LIGHT, DARK

The children are taught the concepts light and dark.

Lesson 2: "Day and Night"
Vocabulary Words: DAY (daytime), NIGHT (nighttime)

The children are taught the concepts day and night in reference to the time that it is either light or dark outside.

Lesson 3: "Today and Tonight"

Vocabulary Words: TODAY, TONIGHT

The children are taught use of the terms "today" and "tonight."

Lesson 4: "Parts of the Day"

Vocabulary Words: MORNING, AFTERNOON

The children are taught the two parts of a day - morning and afternoon.

Lesson 5: "Early, On Time, and Late"

Vocabulary Words: EARLY, ON TIME, LATE

The children are taught what it means to be early, on time, and late.

Book Two

Book Two of the Clock Unit provides an introduction to time telling. It presents the clock and its function and concludes with instruction in beginning time telling skills. There are 4 lessons in this book.

The book begins by introducing the function of a clock, it teaches the children to recognize and label the clock and its parts (face, hand, numbers). The instruction draws the children's attention to each aspect of the clock to which they must attend to in order to tell time. The book concludes with instruction in beginning time telling skills (using the word "o'clock" and showing the passage of one "hour" on the clock).

Lesson 1: "The Clock"

Vocabulary Words: CLOCK, FACE, HANDS

The children are taught to recognize and label the clock and its parts.

Lesson 2: "Long Hand and Short Hand"

Vocabulary Words: LONG HAND, SHORT HAND

The children are taught that the hands on a clock are called the long hand and the short hand, and are introduced to the clockwise movement of the hands.

Lesson 3: "Let's Tell Time"

Vocabulary Word: O'CLOCK

The children are taught to tell time on the hour, using the word "o'clock." They also learn to show the position of the hands for any given o'clock.

Lesson 4: "Hour"

Vocabulary Word: HOUR

The children are taught the concept of an hour with respect to the change in the position of the short hand and long hand.

Book Three

Book Three of the Clock Unit presents the concepts and skills necessary for telling time on the half hour, and also introduces the passage of one half hour on the clock. There are 4 lessons in this book.

The book begins by teaching the children to tell time on the half hour, using the word "thirty," and introduces the passage of one half hour on the clock. A lesson on hour and half hour reviews these concepts and provides activities for further practice on telling time on the hour and half hour. Book Three concludes with a lesson on the concept of a second which serves as a "break" in the sequence of time telling instruction.

Counting by Fives: The first section of Book Three presents several activities for teaching the skill of counting by fives. The activities are to be used simultaneously with the instruction in Book Three, so that the children will have the necessary counting skills to enter Book Four.

Lesson 1: "Telling Time on the Half Hour"

Vocabulary Word: THIRTY

The children are taught to tell time on the half hour using the word "thirty."

Lesson 2: "Half Hour"

Vocabulary Word: HALF HOUR (half past)

The children are taught the concept of a half hour with respect to the change in position of the short hand and long hand.

Lesson 3: "Hour and Half Hour"

Vocabulary Words: HOUR, HALF HOUR

This lesson provides the children with a review of the concepts of an hour and a half hour in terms of the change in position of the hands. In addition, they are introduced to the relative duration of these times.

Lesson 4: "Second and Second Hand"

Vocabulary Words: SECOND, SECOND HAND

The children are taught the duration of a second and the recognition of the second hand.

Book Four

Book Four in the Time Unit is concerned with the basic terms and skills needed for more complex time telling (i.e., telling time in minutes). There are 8 lessons in this book.

The book begins by introducing the concepts of a "minute" and by teaching the children how to count minutes on the clock by fives. The instruction then progresses to the skill of telling time on the right-hand side of the clock, using the phrase "minutes after" (beginning with five minutes interval times, and then proceeding to times to any minute). Next, instruction deals with time using the words "minutes before" (again, instruction begins with five minute interval times, and then proceeds to telling time to any minute on the left-hand side of the clock). The book concludes with a lesson on telling time to any minute (right or left side of the clock) using the term "minutes after."

Lesson 1: "Minute"

Vocabulary Word: MINUTE

The children are taught the concept of one minute in relation to the clock.

Lesson 2: "Minutes"

Vocabulary Words: MINUTES (minute marks)

The children are introduced to the concept of "minutes." In addition, instruction is begun on telling time to five minute intervals; in this lesson, they are taught that it takes five minutes for the long hand to move from one number on the clock to the next.

Lesson 3: "Hour Hand and Minute Hand"

Vocabulary Words: HOUR HAND, MINUTE HAND

The children are introduced to the terms "hour hand" and "minute hand" as synonyms for short hand and long hand.

Lesson 4: "Telling Time by Five Minute Intervals"

Vocabulary Words: MINUTES AFTER (quarter after)

The children are taught to tell time when the clock is set at any five minute interval, up to twenty-five minutes after the hour.

Lesson 5: "Telling Time to the Minute"

Vocabulary Words: MINUTES AFTER

The children are taught to tell time to any minute, up to thirty minutes after the hour.

Lesson 6: "Minutes Before"

Vocabulary Words: MINUTES BEFORE (quarter to)

The children are taught to use the words "minutes before" to tell times on the left side of a clock. The behavioral objectives for this lesson pertain only to five minute interval times.

Lesson 7: "Telling Time to the Minute (Minutes Before)"

Vocabulary Words: MINUTES BEFORE

The children are taught to tell time to any minute before the hour (instruction and objectives are restricted to times on the left side on the clock - up to twenty-nine minutes before the hour).

Lesson 8: "Minutes After around the Clock"

Vocabulary Words: MINUTES AFTER

The children are taught to use the words "minutes after" to tell any time around the clock. Instruction begins with five minute interval times and progresses to times to any minute.

Appendix 5

REVISED TIME WITH THE CLOCK UNIT TEST

SUBTEST 1 - Time Without the Clock

1. Utilize morning

DO: Show Picture A

SAY: What part of the day do you think it is in this picture?	PROMPT: What part of the day does it look like in this picture? Is it morning, afternoon, or night?

Scoring: For an acceptable response, the student must state morning.

2. Relate afternoon

DO: Remove pictures

SAY: What part of the day comes after morning?	PROMPT: If necessary repeat question.

Scoring: For an acceptable response, the student must state afternoon.

3. Utilize night

DO: Show Picture B.

SAY: What time of the day do you think it is in this picture?	PROMPT: If the child does not respond with either morning, afternoon, or night, "Is it morning, afternoon or night?"

Scoring: For an acceptable response, the student must state night.

4.

DO: Remove pictures

SAY: Is it usually light outside or dark outside at night?	PROMPT: If necessary repeat question

Scoring: For an acceptable response, the student must state dark.

5. Match early

DO NOT show any picture

SAY: When you get to school before it starts, are you getting to school early or late?

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the student must state early.

6. Match late

DO NOT show any picture

SAY: When you get to a movie after it starts, are you getting there early or late?

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the student must state late.

7. Identifies before

DO: Use series of 3 pictures of girl getting hair cut. (Pictures C, D, E.) Show picture "D" first and say:

SAY: This little girl is getting her hair cut. Point to the picture that shows her hair BEFORE her hair cut.

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the student must select picture C.

8. Identifies after

DO: Show same series of 3 pictures. Pictures C, D, E.

SAY: This girl is getting her hair cut. Point to the picture that shows her hair AFTER her haircut.

PROMPT: If necessary repeat: Point to the picture that shows her hair AFTER her hair cut.

Scoring: For an acceptable response the child must point to picture E.

SUBTEST 2 - Beginning the Clock

1. Match clock

DO: Show picture of clocks and distractors Picture Y.

SAY: Point to the pictures that show what you would use to find out the time.

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the student must only select the one picture of a clock.

2. Define clock

DO: Remove pictures

SAY: Why do people look at clocks?

PROMPT: If child does not respond appropriately, ASK: What are clocks used for?

Scoring: Acceptable responses would include: "to tell time," "know the time to go to school," etc.

3. Utilize face

DO: Move hand over face of toy clock.

SAY: What's the whole front side of the clock called?

PROMPT: If the child does not respond appropriately, "What's the name of the part of the clock you look at to find out the time?"

Scoring: For an acceptable response, the student must state face.

4. Label hands

DO: Point to hands of toy clock.

SAY: What are these called?

PROMPT: If the child does not respond appropriately, "What do we call the things that point to the numbers?"

Scoring: For an acceptable response, the student must state hands.

5. Defines hands

DO: Remove toy clock

SAY: What do the two hands of the clock look like?

PROMPT: If the child has not noted difference ASK: "How are the two hands of the clock different?"

Scoring: For an acceptable response the student must note the size difference of the hands. Appropriate responses may include: small and big, long and short, little and big, etc.

6. Label numbers

DO: Show each card with number indivdually .

SAY: What number is this?

PROMPT: "What is the name of this number?"

Scoring: For an acceptable response, all numbers three must be named correctly.

SUBTEST 3 - Telling Time to the Hour

1. Tells time/hour (using o'clock)

DO: Show toy clock set at 3:00

SAY: I'll show you a clock and I want you to tell me what time it says	PROMPT: If child responds "3" ASK: 3 what?

Scoring: For an acceptable response the student must use the complete phrase 3 o'clock.

2. Demonstrate o'clock

DO: Use the toy clock. Place long hand on 9 and short hand on 2.

SAY: Move the hands on this clock so it says 5 o'clock.	PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the student must show the correct time (5:00) on the clock.

3. Defines o'clock

DO: Remove toy clock

SAY: At 4 o'clock, where is the long hand pointing to?	PROMPT: If no response, ASK: At 4 o'clock, what number is the long hand pointing to?

Scoring: For an acceptable response, the student must state 12.

SUBTEST 4 - Telling Time on the Half Hour

1. Tells time/half hour

DO: Show toy clock with hands reading 1:30.

SAY: What time does this clock say?

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the student must state one-thirty.

2. Demonstrate half hour

DO: Hand child toy clock with hand set with the long hand on 9 and the short hand on 2.

SAY: Move the hands on this clock to show 5:30?

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the student must set the hands to show the correct time (5:30).

3. Define half hour

DO: Remove toy clock.

SAY: Where does the minute hand point to when it's 4:30?

PROMPT: What number does the minute hand point to when it's 4:30?

Scoring: For an acceptable response, the student must state 6.

4. Identify half hour

DO: Show toy clock set at 7:00. Then show Picture G.

SAY	PROMPT
SAY: This clock shows 7:00. Show me what it will be in a half hour.	PROMPT: Point to the clock on this page - that shows the time it will be in a half hour.

Scoring; For an acceptable response, the student must select the clock showing 7:30.

5. Demonstrate/relative movements of hands

DO: Show toy clock set at 3:00.

SAY	PROMPT
SAY: This clock says 3 o'clock. Now, I'm going to move the minute hand all the way around the clock. Show me where the hour hand will move to.	PROMPT: Would the hour hand move? or show me what happens to the hour hand? Where should this little hand go?

Scoring: For an acceptable response, the student must indicate that the hour hand (short) would move to the 4.

SUBTEST 5 - Telling Time to the Minute

1. Identify minute hand

DO: Show toy clock

SAY: Point to the hand that is called the minute hand.

PROMPT: Show me the minute hand.

Scoring: For an acceptable response, the student must indicate the minute hand (long hand).

2. Tell time (5 minute)

DO: Show toy clock with time set a 2:20.

SAY: Tell me what time this clock says.

PROMPT: Tell me the time on this clock.

Scoring: Acceptable responses include: "two-twenty" or "twenty minutes after two."

3. Tell time (quarter hour)

DO: Show clock set at 3:45.

SAY: What time is it on this clock.

PROMPT: If necessary, repeat question.

Scoring: Acceptable responses include: "three forty-five," "quarter to four," or "fifteen minutes to four."

4. Tell time (minutes after)

DO: Show clock set at 4:11.

SAY: What time does this clock say.

PROMPT: If student responds "four eleven" ASK: You're right - this clock says four eleven. Can you think of one more way to say this time.

Scoring: There are spaces on the scoresheet to indicate child's response as either "four-eleven" or "eleven minutes after four" or both. When considering the class performance, the acceptable response is "eleven minutes after four."

5. Tell time (minutes before)

DO: Show clock set at 2:52.

SAY: What time does this clock say?

PROMPT: If student responds "two fifty-two," ASK: You're right this clock says two fifty-two. Tell me one more way to say this time.

Scoring: There are spaces on the scoresheet to indicated child's response as either "two fifty-two" or "8 minutes before 3" or both. When considering the class performance, the acceptable response is "8 minutes before 3."

6. Demonstrate minutes after

DO: Hand child toy clock (long hand at 9, short hand at 6)

SAY: Move the hands on this clock to show 18 minutes after 3.

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the child's placement of the hands must be exact.

7. Demonstrate minutes before

DO: Use clock in position after question #6.

SAY: Now, move the hands on the clock to show 9 minutes before 5.

PROMPT: If necessary, repeat question.

Scoring: For an acceptable response, the child's placement of the hands must be exact.

8. Counting minutes by 5

DO: Show picture H.

SAY: Point to the large numbers to show me how to count the minutes around the clock. Show me how to count by fives around the clock.

PROMPT: If child does not respond, SAY: Count by fives around the clock out loud, and show me as you count.

Scoring: For an acceptable response, the student must count 5, 10, 15, 20 to 60 while pointing to the appropriate large numbers on the clock.